Welding Engineer

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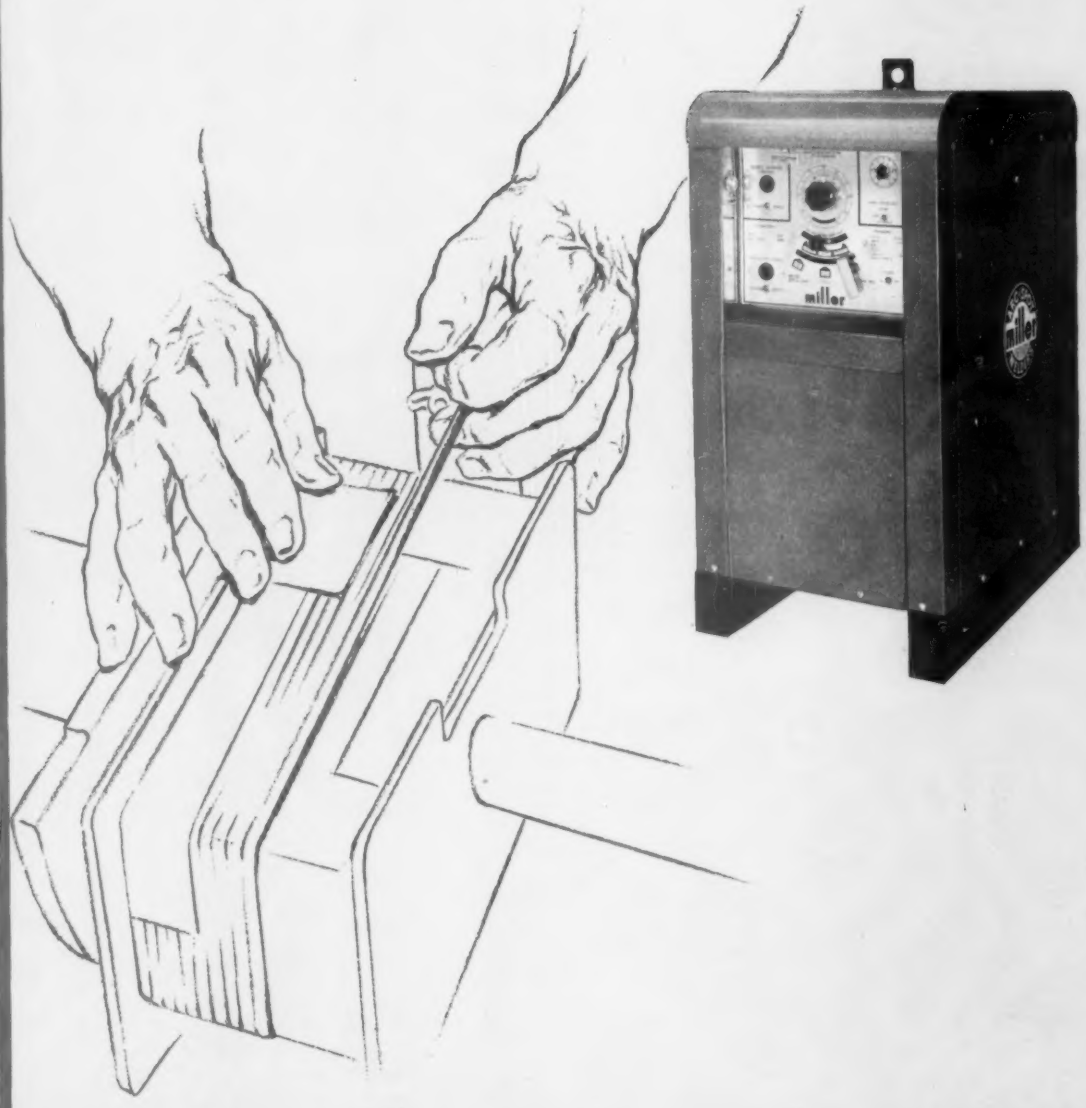
MARCH, 1957



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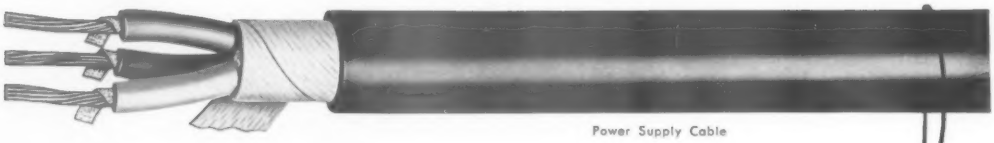

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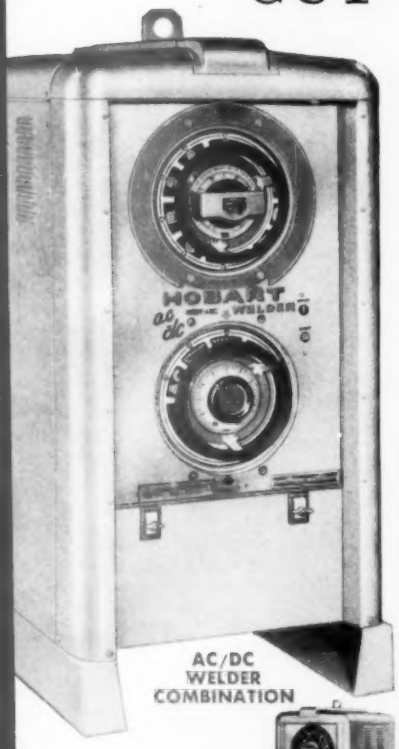

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New Convenience – many built-in extras, such as remote control and fast acting polarity switch – at no extra cost – that's the story of Hobart Welders.

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For instance, the brand new Hobart AC-DC Welder lets you take full advantage of the latest types of electrodes and sizes for both AC and DC welding. In addition to having AC or DC welding, you'll want to see and know about variations of this welder that let you do Inert Gas Welding.

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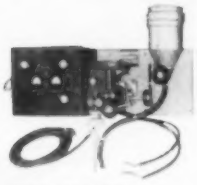

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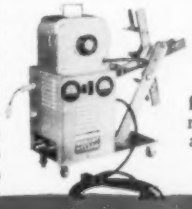
submerged arc welding with new "simplified" controls



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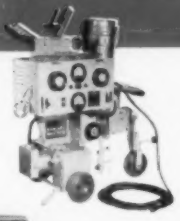
for semi-automatic submerged arc welding

"Simplified Control Automatic Welding"

Eliminates complicated electronic controls. Even less experienced weldors can double output and produce uniform high quality welds.



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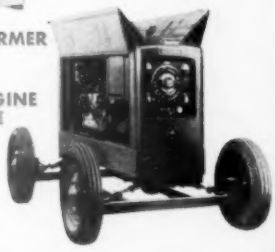
for submerged arc welding

DC RECTIFIER

C TRANSFORMER

GAS ENGINE DRIVE



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for automatic arc welding

See demonstrations

of these amazing new welders

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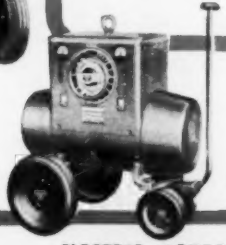

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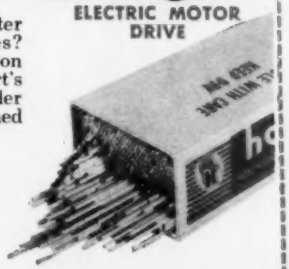
Have you tried the new and faster Hobart Iron Power Electrodes? Keep pace with faster production and lower cost welding. Hobart's "Rocket 24" hi-speed iron powder electrodes are especially designed for using the "drag" technique. Deposition rate is much higher than conventional type electrodes. Beads are smooth. Slag is practically self removing. Get more inches of weld per electrode. For proof —try a few "Rocket 24" electrodes on your own work.



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- ☐ AC Transformer
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545-W Welder's Cup-type Goggles

401-7H CESCO Hat 'n' Shield

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410 Helmet for cramped quarters

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NEW Ratchet-adjusting, tough plastic headgear for helmets & face shields

CESCO #438-FT Face Shield is strong, rugged, light-weight and easily tilted off the face. It is constructed of translucent fiber glass material.

New CESCO GI-R Headgear for welding helmets and face shields. Adjusts to any head size with a few quick turns of the ratchet.

• The new CESCO G1-R Headgear permits quick, easy and comfortable fitting. It adjusts to the required head size by a mere turn or two of the adjusting ratchet.

The new headgear is constructed of exceptionally long-wearing high-impact vinyl compound. It is impervious to perspiration or chemical action and is easily cleaned.

This headgear is now available on all CESCO welding helmets and face shields. It is illustrated here with the new CESCO #438-FT Face Shield.

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Welding Engineer

MARCH, 1957
VOL. 42—No. 3

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's Pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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SPECIAL FEATURE

A background for evaluation of acetylene and propane—I 31
J. Okladek

FABRICATION

Stud welding is good medicine for coke-car floor plates 29
Welded "blankets" of ultra-thin stainless 38
Byron R. Russell

"Conditioned" just right by projection welding 40
Brazing lengthens reel life 50
English weldors end a 10,000-mile gas-pipe system 72
John Grindrod

CONSTRUCTION

Father-son team builds welded garage addition 37
Welded aluminum towers serve two purposes 42
F. T. Tancula

OPERATION

Something new for mild steel welds 35
Resistance uses are limited only by imagination 44
Jack Fairlie

Aluminum-bronze to the rescue 58
Wayne E. Claflin

500,000 welds—and more to come 68

MAINTENANCE

Welder cuts costs in rebuilding tamps 76

CONVENTIONS

The Midwest meeting views modern welding 52
It's Los Angeles again for the Metals Congress 56
Robert Kular

IAA: Stettner to receive Morehead Medal 63

DEPARTMENTS

News 5
Letters to the editor 12
Your WeldWorld at press time 17
Between Passes 25
Editorial: *A nosegay to an industry* 27
Data Sheet No. 198: *Properties of acetylene, propane and oxygen* 33
The Welding Clinic: *Tips on grinding wheel selection* 68
On the job 70
30 years ago 71
New Products 78
People 99
Free Literature 102
The Welding Shopper 103
Literature offered in ads 104
Advertisers in this issue 104
Welding Info-Aids 105

Musketeer
+new
FIBER VISOR with WELDING LENS

For use in scarfing and furnace work, heavy gas welding and cutting, this vulcanized fiber shield, 6⅝" deep, holds filter lens of desired shade and cover glass in insulative lens holder of high-impact resistant thermosetting plastic.

Musketeer
+new
METAL-BOUND PLASTIC VISORS

The full line of visors as made for the long popular type J-1 Eye and Face Shield are now available with the Musketeer Headgear. Much improved with a sturdy metal binding, they hold their desired shape. Made 11⅛" wide, in depths of 4, 6, and 8 inches (shown) in clear Plastacele .020", .030" and .040" thick, and in light, medium, and dark green Plastacele in .020" thickness only.

new QUALITY JACKSON PRODUCTS *one for all*

Musketeer

A Durable, Comfortable and Convenient Headgear Assembly with a Choice of Four Eye and Face Shields

Sucessfully used before on JACKSON'S arc welding helmets, the *Adjust-O-Lok* headgear, with its exclusive friction pivots, combines with a new, wide *Spark Deflector* to carry a choice of interchangeable eyeshield visors snapped to its front.

Headband and cross strap, both adjustable to size, are molded in one piece of lightweight, nonconductive Nylon. Headband adjustment is made by a large, easy to handle winged knob and gear, also of Nylon, while wearing the shield; enclosed mechanism is smooth against the head. A cork-padded sweatband is optional at extra cost.

The Nylon friction pivots are also adjustable while the shield is worn, locking it in any position or allowing free up and down movement.

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

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ARC WELDING ACCESSORIES AND SAFETY EQUIPMENT

Musketeer *+new*
KING-SIZE ALL-PLASTIC VISORS

Designed for greater protection in both width and depth, 15½" wide by 9" deep, they are made in clear Plastacele .020" and .040" thick, and in light, medium, and dark green .020" thick only. (Interchangeable with type F-1 Face Shield visors, used with the Jackson Safety Hat.)

Musketeer
+new
WIRE SCREEN VISOR

For use in furnace work and drop forging, this galvanized steel, 24-mesh visor, 15½" wide by 9" deep, catches molten metal, disperses heat.

—General Electric Co.

WELDING was called upon to seal rivets and seams on this 55,000 gal oil storage tank in Tulsa, Okla. ***(See story below.)***

FLAME-CUTTING a large riser from casting, operator employs new torch. Technique demands extensive preheat operation and up to 9,000 cu ft of oxygen per hour. ***(See story below.)***

News

Welding rivets on oil tanks

Welding stepped into the breach for the umpteenth time when the D-X Sunray refinery at Tulsa, Okla., used the process to seal wobbly rivets and leaky seams on eleven 55,000-gal oil storage tanks. Over 12,000 ft of welds were needed to encircle each rivet and seal each seam on the tanks, which were built in 1916 by the hot-rivet-and-sledge-hammer method. When tank plates had been sandblasted and cleaned, welding was performed on a round-the-clock basis—often during 100-degree daytime temperatures.

NCG schedules plant expansion

A program for construction of industrial gas facilities and expansion of present plants has been scheduled by National Cylinder Gas Co., Chicago. The plan includes a $3,000,000 addition to NCG's liquid oxygen plant in Chicago to increase output by 150%. Construction should be completed this summer.

Expansion of facilities at six locations in Alabama, California, Illinois, Puerto Rico and Venezuela is also scheduled. A plant in San Leandro will begin production soon, as will a new hydrogen plant in Huntsville, Ala. Construction was to begin at San Juan, P. R., on an oxygen and acetylene plant; NCG is also building a new oxygen plant at the iron ore mine port of Puerto Ordaz.

Plans proceed for Eutectic in Brazil

Completion of a new plant in Sao Paulo, Brazil, is proceeding on schedule, according to Rene D. Wasserman, president of Eutectic Welding Alloys Corp., Flushing, N. Y.

Equipment in the new plant will be installed in the near future. Manufacturing facilities will consist of modern equipment for production of welding electrodes, rods, brazing alloys and solders. The new plant will also house a research laboratory and a special section devoted to the Eutectic Welding Institute for training weldors. The new plant is expected to begin operation by late spring.

New plant for Trent Tube

Trent Tube Co., a wholly-owned subsidiary of Crucible Steel Co. of America, has completed plans for opening a second plant for manufacture of welded stainless steel and high-alloy tubing and pipe. The new plant will be located at Fullerton, Calif., and is scheduled for completion by mid-1957.

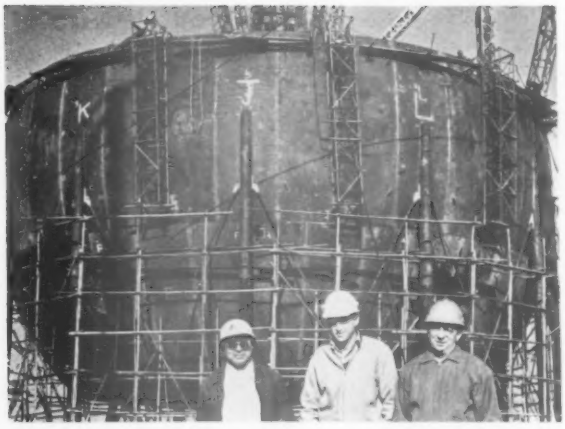
One-man removal of casting risers

Introduction of a manual oxyacetylene torch capable of cutting through heavy metal sections now permits one-man removal of casting risers from 20 to 400,000 lb. Castings in this size range need not be moved for the cutting operation.

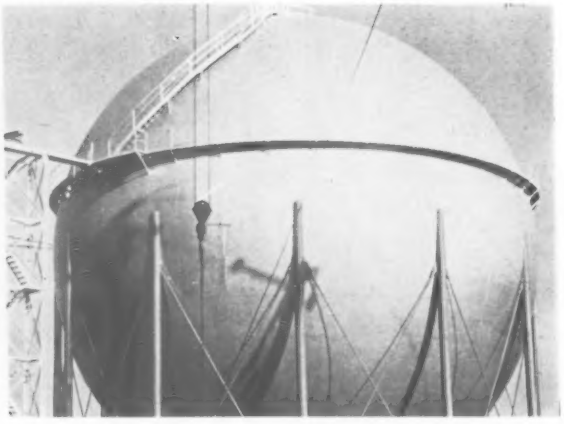
The new torch, developed by Linde Air Products Co., New York City, is capable of cutting through steel as thick as 55 in. in a single pass. A specially-designed head offsets the torch tip from the line of cut, allowing an operator to widen kerf uniformly by simply rotating the torch. The torch also has a cartridge for thorough gas mixing.

Airco Pacific begins L.A. plant

Construction for Airco Pacific of a multi-million-dollar air separation and liquefaction plant at Bassett, Calif., began February 7 with groundbreaking ceremonies. The new plant will have a daily production rating of 55 tons of high-purity liquid oxygen, 15 tons of liquid nitrogen and 3½ tons of liquid argon. Scheduled for completion late this year, it will serve California, New Mexico and Arizona. This is the fourth facility of its kind constructed by Air Reduction.



STORAGE tank for manufactured gas is this partially completed "Hortonsphere" designed by Chicago Bridge & Iron Co. for Tokyo (Japan) Gas Co. T-1 steel shipped from the U. S. was used throughout by an all-Japanese welding crew employing American low-hydrogen iron-powder electrodes. Personnel here are (l. to r.): Matsuno Ishikawajima, general supervisor; William Gross, welding supervisor; R. F. Mitchell, superintendent. When completed, the vessel . . .



. . . is a handsome addition to the Tokyo landscape. It is 92 ft 7 in. in diameter, and is designed to operate at 120 psi. This vessel, and another like it, was constructed by Ishikawajima Heavy Industries Co., Ltd. These on-the-job photographs were made by E. J. Brady, president of Alloy Rods Co., on a recent trip to the Far East. *(See* **WELDING ENGINEER,** *July, 1956, p. 30:* **"In Japan—weldors erect new T-1 steel vessels.")**

Selas forms European division

Selas Corp. of America, Dresher, Pa., has formed a European subsidiary to be known as Selas Corp. of America, European Division S. A., with headquarters in Geneva, Switzerland. The new firm will service western Europe. Six European companies have acquired licenses to Selas processes and know-how. W. Jack Hoffman is general manager of the new subsidiary; A. E. Baltus is sales manager.

M & T opens new Houston facilities

Metal & Thermit Corp., New York City, recently opened its new warehouse and sales office facilities in Houston, Texas. Both are located at 701 N. San Jacinto St. in that city.

Nuclear Congress to be in Philadelphia

The 1957 Nuclear Congress will be held March 11-15 in Convention Hall, Philadelphia. Sponsored by more than 20 engineering and technical societies, the Congress will include more than 200 technical papers and two days of conference for executives interested in atomic energy. Concurrently the International Atomic Exposition will display latest developments in the atomic field. Attendance at the congress is expected to exceed 3,000 visitors, the atomic exposition expects at least 18,000 persons. Of interest should be sessions on reactor design, metallurgy, shielding and construction. Among exhibits will be X-ray and radiographic equipment, controls, inspection devices.

RW Corp. builds new plant

Currently under construction in Bay City, Mich., the new manufacturing plant of Resistance Welder Corp. will provide an additional 40,000 sq ft of manufacturing area. A center bay will provide the large areas needed for assembly and testing of automated equipment. New general offices and an engineering building are to be added in the future. The new plant is scheduled for completion in May, 1957. General offices and manufacturing facilities will remain at present locations in Bay City until the new facilities are completed.

Magnaflux expands plant facilities

Magnaflux Corp. recently completed an addition to its main plant at 7300 W. Lawrence Ave., Chicago. The new structure increases assembly area by 10,000 ft and will be devoted to production operations.

AWS meeting honors founder

To honor Dr. Comfort Adams, the American Welding Society has renamed its spring meeting this year the "Adams National Meeting." Dr. Adams, who will be 89 this year, is the founder and first president of AWS.

Operation change for Universal

Universal Welder Corp., Cleveland, has transferred its engineering and manufacturing operations to Electric Arc, Inc., Newark, N. J. At the same time, Universal also transferred sales of its product to a new company known as Universal Electric Sales Corp., 2557 E. 79th St., Cleveland. A. Leslie Pfeil has been named vice president in charge of sales. The new corporation will also sell induction heaters manufactured by Electric Arc, Inc.

It's upkeep at maintenance show

Upkeep of the nation's factories, automation and new products designed to keep plants producing were among the topics of discussion at the 8th National Plant Maintenance & Engineering Conference and Show held Jan 28-30 in the Cleveland Public Auditorium.

Over 400 companies exhibited products ranging from hydraulic lifts to pipe cutters, welding fittings, weld-

(Continued on page 94)

nothing to stop you . . .

look — its sturdy, smooth, safely silver soldered tubes glide effortlessly through the operator's guiding hand. No obstructing coupling nut or tube joint hinders good performance, suggests the possibility of dangerous gas leaks. So many outstanding, modern and economy producing advantages have been incorporated into NATIONAL flame cutting torches that you, too, will find it to your interest and profit to write for the now rather famous brochure . . .

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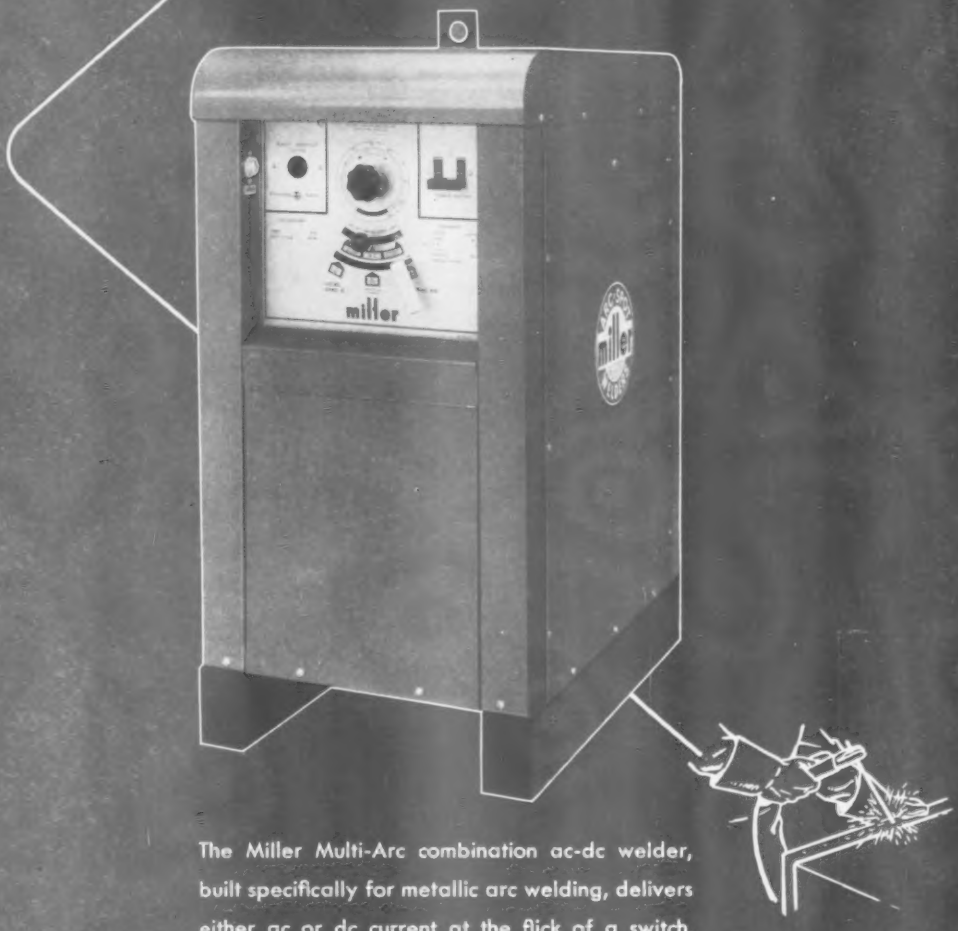
the NEW miller MULTI ARC combination ac-dc welder



The Miller Multi-Arc combination ac-dc welder, built specifically for metallic arc welding, delivers either ac or dc current at the flick of a switch. Electrical control circuit eliminates mechanical controls. Primary switch is standard equipment; Power Factor Correction optional. Six models from 10 to 525 amperes—all with 60% duty cycle ratings.

Complete specifications sent on request.

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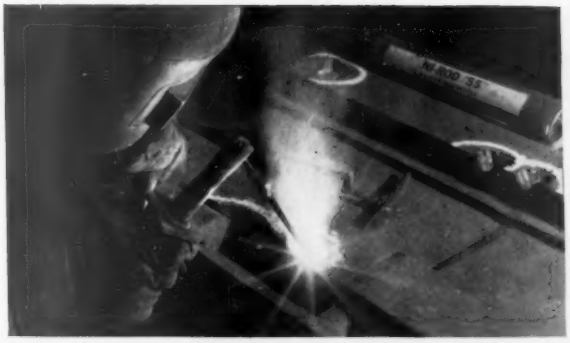

Fast salvage of castings—Ready for the junk pile, this 600-lb. water pump casting looked like a complete loss. But the foundry welded it back into sound condition with only 7 lbs. of Ni-Rod "55" electrode. The job took 1½ hours—saved a $260 casting.

Profitable production work—This pedestal for a grinder is a profitable item for one foundry. The design calls for joining 1-inch steel pipe uprights to the cast iron members. Welding the dissimilar metals with Ni-Rod electrode costs far less than machining or bolting.

Easy repairs—Dredged up from the bottom, a rock broke through the side of this 4,200-lb. semi-steel dredge pump casing. A weldor using 10 lbs. of Ni-Rod "55" electrode—about $20 worth—welded a patch over the break, repaired the $1,500 casting.

Reliable plant maintenance—A 2-month lay-up of a $9,000 fork lift truck threatened owners when a 750-lb. cast iron fender cracked. The break, in the center section which is bolted to the truck, was welded with Ni-Rod "55" electrode. The company saved $725.

Proved on job after job: Ni-Rod and Ni-Rod "55" weld cast irons easily!

Over the entire range of profitable cast iron welding—from production work to field repairs—Ni-Rod* and Ni-Rod "55"* electrodes simplify the weldor's job.

These easy-handling electrodes team up high-nickel core wire with special flux coatings to give stable arc ... smooth bead contour ... easy slag removal ... *strong, sound, machinable welds.* And preheat or post-heat is seldom needed.

"A Handy Guide to Welding Cast Irons" tells more about the *variety* or successful welding you can accomplish with Ni-Rod and Ni-Rod "55". This illustrated booklet also contains dozens of technical welding tips. Send a postcard requesting your copy. *Registered Trademark

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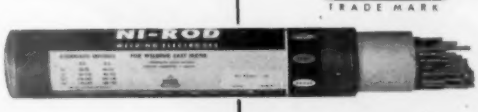
Electrodes • Wires • Fluxes



NOW...

NEW PRODUCT FROM KAISER WIRE

. . . the lightest welding cable ever made!

ONE-THIRD LIGHTER THAN COPPER CABLE...BECAUSE IT'S MADE OF KAISER ALUMINUM

Greatly reduces fatigue . . .

New aluminum welding cable is *twice* as easy to lift and drag around—an important factor in reducing fatigue and increasing job efficiency.

Makes work easier . . .

The fine wires used for aluminum welding cable make it extremely flexible. Aluminum cable can be looped into a small circle with thumb and forefinger to demonstrate how easily it handles as a whip-lead.

Runs far cooler . . .

Aluminum dissipates heat faster than copper cable of equivalent size. Thus, the aluminum cable and electrode holder is far cooler to handle.

Takes hard wear . . .

Tough GRS rubber or Neoprene jacket resists abrasion, acids, sunlight and heat. Neoprene jacket is fireproof.

Takes good connections . . .

Both mechanical connections and soldered connections are simple to make with aluminum welding cable. You can easily connect aluminum to aluminum, or aluminum to your old copper cables.

Saves money . . .

The favorable price of aluminum, when compared to copper, provides important economies. And you continue saving money even when you specify aluminum larger than copper to offset its slightly lower current carrying capacity.

Install aluminum whip-leads now!

Until your copper cables come up for replacement, your existing copper lines can easily be equipped with light, flexible aluminum whip-leads by means of simple mechanical connections. Weldors can tell the difference immediately! And as your copper cables are ready for replacement, you can take full advantage of aluminum for the entire line.

For complete information on new aluminum welding cable, contact your welding equipment manufacturer or your nearby welding supply distributor. Aluminum welding cable is produced for equipment manufacturers by Kaiser Aluminum at the Company's Newark, Ohio wire and cable mill.

Kaiser Aluminum is a leading producer of electrical conductor for transmission, distribution and service drop lines. In addition, Kaiser Aluminum produces building wire and other aluminum conductor products for industry.

At your request, we will be glad to send you our informative booklet, "New Advantages in Arc Welding Cable with Aluminum Welding Cable." Write to Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Bldg., Oakland 12, California; *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois.

Kaiser Aluminum

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.

Tough! as they come

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Biggest sellers in the Atlas line—All-steel
"Rebit" replaceable bit Tomahawks with steel handles
"Dual Tools" Tomahawk and brush with and without replaceable bit
One of a big selection of Atlas wood handle Tomahawks
Atlas quality in low cost all-steel Tomahawks

Ask your welding supply dealer to show you the Atlas line

They ask us: *WHY* 30 *MODELS?*

We Answer:

—because weld cleaning jobs offer such a wide variety of problems—because welders have strong preferences for certain tool styles. Atlas has made a sincere effort to provide you with the tool you want regardless of your likes and dislikes, in ATLAS QUALITY!

ATLAS WELDING ACCESSORIES INC.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Why concrete?

Dear Sir:

I have been a subscriber to WELDING ENGINEER since 1936 and a reader since 1932, and I would not be without it.

In the January editorial, "New year . . . new leaf?" I am with you all the way. Why not more welded construction? I have seen lots of bridges being built here in Michigan and also in other states. What I would like to know is why do so many states insist on concrete reinforced bridges? One can readily see that salt used on the roads in wintertime erodes the concrete. If steel were used, it would last much longer.

Also, when one figures the cost of all the forms, one wonders why a bridge must have concrete reinforcement?

Here in Michigan, on the Detroit-Toledo turnpike and also on the Detroit-Brighton highway, one gets a sad picture of all-concrete construction.

Seiber M. Karnes
Howell, Mich.

From Canada

Dear Sir:

I really enjoy reading WELDING ENGINEER and look forward each month to receiving the new issue. I would like to commend you and the rest of the staff for turning out a really first class welding magazine and wish you every success in the future.

R. Schaal
Fort Williams, Canada

Visit
WELDING ENGINEER
Booth 111

WELDING SHOW
Philadelphia, Apr. 9-11, '57

50% greater elevation means larger weldments...faster welds

P&H welding positioners top them all!

Height comparison chart for model WP-3 P&H Welding Positioner

Mfr.	Minimum	Maximum	Range
P&H	46¼"	82¼"	36"
"A"	34½"	54½"	20"
"B"	42"	66"	24"
"C"	40"	55"	15"

The chart on the left clearly shows how a typical P&H Welding Positioner has a 50% greater elevation—can turn larger weldments and lift them almost 1½ feet higher than competitive makes.

Welding is easier, faster, with a P&H Positioner. Table tilt is clear through 135° — without legs or posts to interfere with rotation.

Capacities range from 500 to 100,000 lbs. Send today for booklet "What you should know about Welding Positioners." Address: Dept. 311B, Welding Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H WELDERS · ELECTRODES · POSITIONERS

Milwaukee 46, Wisconsin

PAGE offers a line of —the right packaging—the

In ever-increasing numbers, users of welding wire are looking to PAGE for their wire needs. The one biggest reason is that they have found that PAGE—in a unique degree—has the *facilities, experience* and *special skills* to draw and furnish exactly the right wire for your welding jobs. And behind that lies a story.

All Processes Closely Controlled

PAGE is *the one supplier* of welding wire who is in a perfect position to control the chemical and physical properties of its products all the way from billet to rod to finished wire. That is because we purchase our raw materials to rigid specifications; we select heats of carbon, low alloy and stainless steels for certain optimum characteristics—then, upon delivery to the mill, we analyze representative samples for compliance with PAGE specifications.

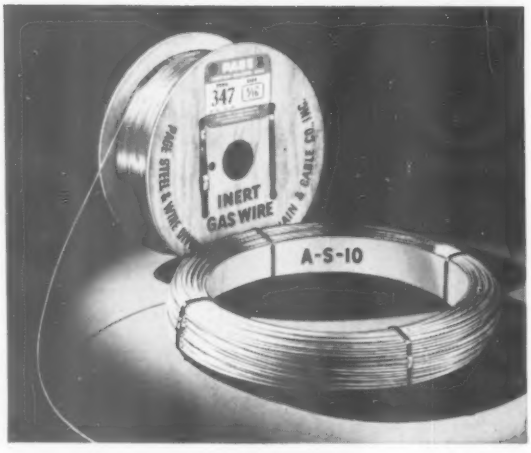
These purchasing and testing practices permit the production of wire capable of depositing weld metal which complies absolutely with welding requirements. *You don't have to compromise* when you buy, specify or use welding wire by PAGE!

Page Meets Today's Needs

One example of PAGE'S facilities for furnishing a wide range of quality-controlled welding wires for modern applications is shown by our stainless steel automatic welding wire. To meet needs of recent developments in the field of inert gas welding, PAGE offers fine wires (.020″ to .09375″) for use in semi-automatic arc welding machines in which the arc is shielded with argon, helium or CO_2 inert gas. These wires, wound on non-returnable plywood reels, furnish the utmost in convenience and freedom of wire feed.

Wire for All Types of Welding

You will find many advantages in standardizing on PAGE welding wire for your needs—whether for automatic or manual use . . . arc or gas welding of all types. Not only does PAGE offer a wide range of analyses, as shown in the column at the right, but we have unsurpassed facilities for manufacturing wire to any desired size, temper or surface finish—and can furnish it promptly, in many methods of packaging, through the convenient nation-wide PAGE Distributor service.



The Right Wire— Wide Analysis Range

There are *26 different analyses* in the PAGE line. These cover the field of applications: heavy automatic submerged arc...light manual submerged . . . inert gas manual . . . automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.90-1.10)

LOW ALLOYS...All the most popular welding grades.

STAINLESS...All standard AISI grades. Other types on request.

GAS WELDING RODS

Since 1914, the standard of quality, uniformity and satisfactory performance. PAGE offers an exceptionally wide range of rods—furnished in 36-inch lengths, in coils or on reels in the following materials: Mild Steel • Armco • Low Alloy • Carbon Steel • Stainless Steel • Manganese Bronze • Naval Bronze

BARE ELECTRODES

PAGE Bare Electrodes are supplied in any carbon from Armco to high (.90-1.10) carbon.

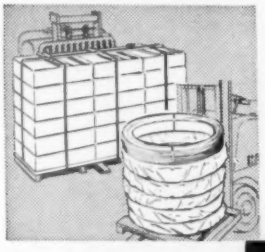
METAL SPRAY WIRE

Furnished as follows: Any carbon from Armco to 1.00 carbon • Low Alloy • Stainless Steel • Manganese Bronze • Naval Bronze

the right welding wires
right service—for modern needs

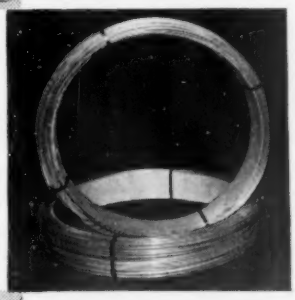
PAGE WIRES ARE PACKAGED RIGHT

PAGE Welding Wires are packaged in a wide variety of ways for the most complete protection and the utmost convenience in handling, in stocking and in use.



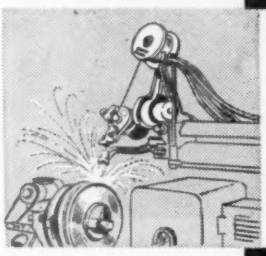
Wrapped Coils and Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproofed paper. ...Also, coils in individual cartons, singly or palletized.



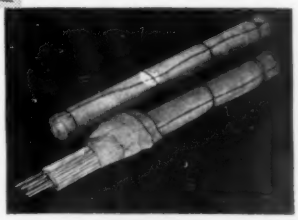
Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer wound coils with cardboard liner, four Signode straps to facilitate coiling and easy unwinding.



Handy Reels

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.

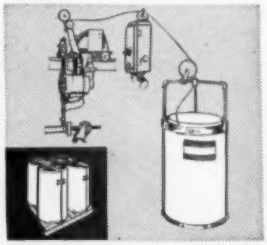


Gas Rod Packing

Gas welding rods are packed in 36" lengths in 50-lb. bundles—paper and burlap wrapped. Also in coils and reels (approx. 150 lbs.)—burlap wrapped. Stainless rods also come in 10-lb. fibreboard cartons.

LEFT: Pay-off-pak ready for filling, with "wire slinger" for uncoiling at extreme left. RIGHT: "Wire slinger" installed for feeding out wire; also, below, re-usable lid and retaining ring. Ring insures smooth feed-out of wire without snarls or kinks.

Sketch at right shows Pay-off-pak for continuous feeding up to 500 lbs. of wire without rethreading. Also (inset) lightweight Leverpaks. Both these containers protect against coil distortion... are easily opened, resealed, handled, stored.



PAGE Service Means Prompt Delivery From Local Stocks

You can get PAGE automatic arc welding wire, or oxy-acetylene welding rods quickly and easily from your nearby PAGE Distributor.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory.

Send For These

Folder **DH-402A**—PAGE Submerged Arc and Inert Gas Welding Wire.

Booklet **DH-1277**—PAGE Gas Welding Rods.

Write our Monessen, Pa., office for *either or both*

Meet us at BOOTH 634
WELDING SHOW
Convention Hall
PHILADELPHIA
April 9-11, 1957

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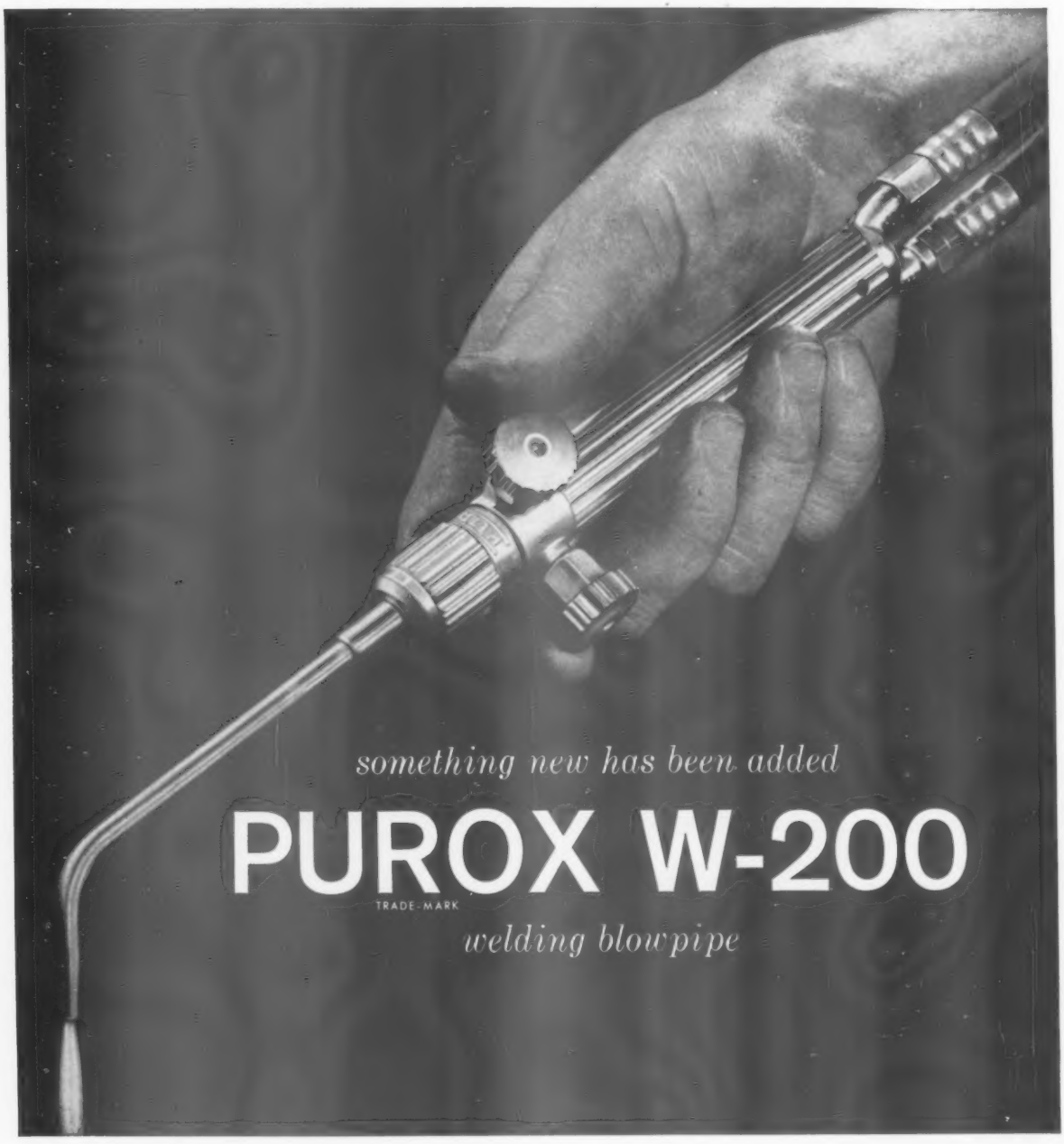
Better Value



A flick of the wrist slips this eight-ounce blowpipe into corners, around jigs and fixtures or into any other hard-to-reach spot with ease. Small and handy, the PUROX W-200 Welding Blowpipe combines operating comfort with results that bring all types of light welding work up to the most modern standards.

Everything about this blowpipe has been designed to eliminate excess motion and to help cut down operator fatigue. Forward valves, for example, permit instant flame adjustment with the same hand used to hold the blowpipe. Snap-in heads with "O" rings connect simply and seal gas-tight without a wrench. They can be rotated on the blowpipe handle without shutting off the flame. Heads in nine sizes give a complete welding range from 32 ga. to ⅜ in. thick.

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or write: LINDE AIR PRODUCTS COMPANY
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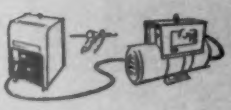
MARCH
1957

Your *Weld World* at press time

Last minute news of interest to those engaged in joining and severing materials.



. . Strike of Oil, Chemical and Atomic Workers Union at three Linde oxygen plants is causing a serious shortage in steel and metal-working industries. Linde has kept hospitals and medical units supplied as before, but steel and metals are getting about half of what they were before strike, which began Jan. 25. Struck plants are at Kittanning and Essington, Pa., and Youngstown, Ohio . . . which comprise about 40% of Linde's oxygen-producing capacity. East Chicago, Ind., and Ashtabula, Ohio, plants, where workers are not organized, are being picketed. OCAW union just lost election at East Chicago a few weeks ago. As we went to press, no settlement had been reached, and no new meetings scheduled. Linde, which negotiates locally, sees the strike as an attempt by union to force it to bargain with OCAW-represented plants on a national scale. One OCAW local, at Evansville, Ind., accepted Linde's terms and is not out on strike.

. . Sales rights to a salt-bath brazing alloy for aluminum have been assigned to Handy & Harman Co. Developed by Glen L. Martin Aircraft Co., the powdered alloy is mixed with flux and painted on parts as paste. Drying operation prevents possible explosive contact between wet flux and molten salt. Process will be displayed at AWS Welding Show in April.

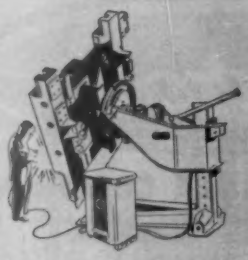
..Weldment sales picture looks bright, with some producers predicting rises from 30 to 50%. Reason for optimism: industry diversification and advance in welding techniques, which have made for larger weldment market.

. . Two firms in the arc-welding accessory field are planning to add aluminum electrode holders to their lines.

. . Inflation warnings from the administration are falling on deaf ears . . . especially while Uncle Sam himself continues to spend billions abroad. However, recent "curl your hair" prophecies by Humphrey and Hoover have given the stock market the willies, with many persons now re-appraising predictions of the 1957 boom. Much more uncertainty about the boom is now evidenced.

. . Nickel, still in short supply, actually was produced at a record rate in 1956, according to International Nickel of Canada. The free world's output was 450,000,000 lb last year. . . . Some press reports have the federal government contemplating sale of its Nicaro (Cuba) nickel mine to private interests.

. . Most other metals, however, are plentiful. Even steel, except for structural shapes and some plate, is in good supply. The Big Three of the copper industry recently cut the price of that commodity 2 cents per pound because of decreasing demand, increasing supplies.



. . High-frequency welding, one of the topics discussed at recent Midwest Welding Conference, will be detailed in an article soon to be presented in Welding Engineer. Atomic Energy Commission approval is holding it up.

. . Price index in metals and metal products during 1956 jumped to a 148.4 average from 1955's average of 136.6. This was one of the more inflationary trends of 1956 . . . especially when compared with other industries.

..Copper and Brass Research Association calls 1956 a "year of adjustment" for copper. Pattern foreseen for 1957: copper supplies to remain adequate and price movements to narrow. Generally, CBRA is cautious but optimistic about this new year.

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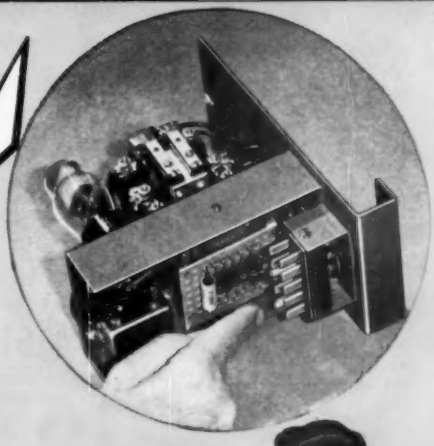
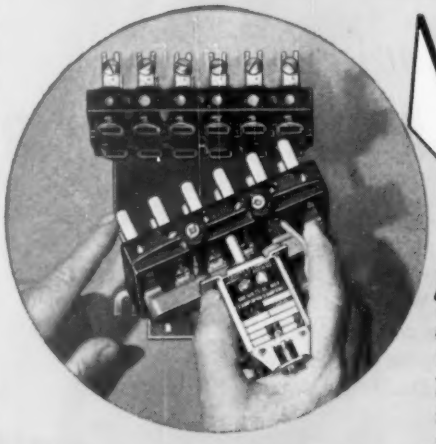
Welding Press Control illustrating simple removal of plug-in electronic timer



Plug-In TIMERS

are designed to stand up under hard industrial usage. Both timers and sequencing relays can be installed in a matter of seconds. Down time is reduced to absolute minimum during replacement. Timing circuits are fail-safe—if any tube fails to fire, circuit will be opened and welding process stopped instantly.



Plug-in relays being removed from welding press controller
Faster electrical maintenance

Plug-In RELAYS

are of special rugged industrial design and construction. Flexibility provided by plug-in feature (on both sequencing relays and timers), permits easy circuit changes without complete controller redesign.

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Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

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Welding Progress

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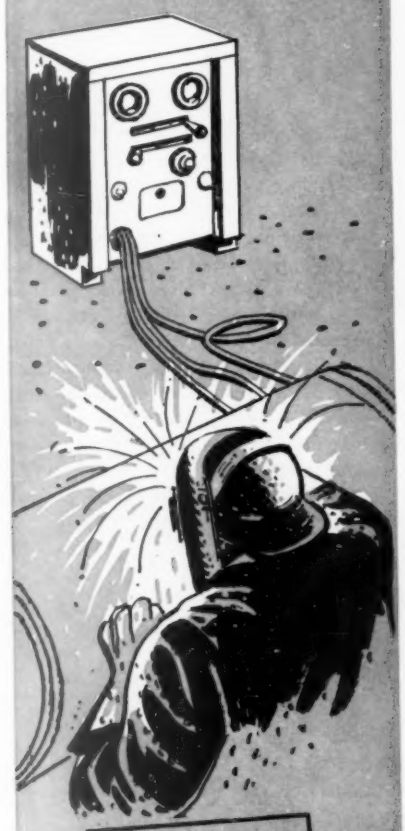

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PLATING MATERIALS • ORGANIC COATINGS
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CONTROLLED ARC POWER SUPPLY ADVANTAGES FOR SEMI-AND AUTOMATIC WELDING TO BE DEMONSTRATED

New M&T welder eliminates variables in operation, lowers costs, improves quality.

"Live" demonstrations of Metal & Thermit's new Controlled Arc Power Supply for constant voltage welding will be the focal point of this year's M&T exhibits at the Western Metal Exposition in Los Angeles March 25-29, and also at the AWS show in Philadelphia April 9-11.

This rectifier-type machine delivers DC welding current at constant preset voltages. The demonstration will show how the Controlled Arc Power Supply teamed with a constant speed wire feed automatically controls the arc maintaining a constant arc length. A built in Arc Characteristic Controller provides a "cushion" effect, particularly desirable in low current density welding, and permits a greater range of current density with a given electrode. The result is lower cost, higher quality weldments.

C.A.P.S. welders have an efficiency of 85% or better and a power factor of 90% or higher at all settings. The equipment is rated at 100% duty cycle. Lighter and easily installed input wiring and switching are possible, since less input and current is required than in conventional power sources. Installation and power costs are both appreciably lower. These and other advantages of the C.A.P.S. welder may be discussed with representatives at the Metal & Thermit booth.

Low hydrogen coatings improve hard surfacing electrodes

A new and different approach has been made to improve the quality and wearing characteristics of hard facing overlays. Low hydrogen coatings adapted to Metal & Thermit's HARDEX line enable these electrodes to deposit a weld metal of far less porosity and greater freedom from cracking. Penetration into the base metal and dilution by the base metal are at a minimum.

The wide line of HARDEX electrodes enables the welding engineer to select the *one* electrode which provides the best wearing quality at the least cost per pound of metal deposited. An M&T catalog, HS-56, is available through any M&T representative to simplify the selection of the right HARDEX electrode for any one of hundreds of applications.

New chrome-moly electrodes approved

For years one of the nation's foremost producers of power piping and high pressure boilers has been using a specially developed chrome-moly electrode on high pressure — high temperature service equipment. Its outstanding stress-rupture characteristics, high ductility over a wide range of temperatures, and economic advantage over other electrodes has proven the answer to safe, crack-free welds wherever high pressure—high temperature service is required.

Since these electrodes were first introduced by Metal & Thermit under the name Murex® CROLOY, more than half of the country's top petroleum refineries have approved their use for fabricating critical service equipment used in high pressure, high temperature operations. Welding engineers in other industries, too, are finding more and more use for CROLOY on other difficult-to-weld steels. A folder on M&T CROLOY electrodes and how to use them may be obtained through any Metal & Thermit representative.

SEND FOR YOUR FREE COPY...

With the recently developed DEOXO and BLACK FLUX added to the line of APW Fluxes, you can at last key *the selection of flux to the precise requirements* of the job in production.

Do this to get easier, more rapid, *consistent production*, greater economy and fewer rejects. Our fluxing manual "A Complete Guide To Selective Fluxing For Low Temperature Silver Brazing" provides all the data you'll need to know why and how to make the correct selection of flux.

Write for your copy, *today!* We'll be glad to rush it to you by return mail —no charge, of course. ★ ★

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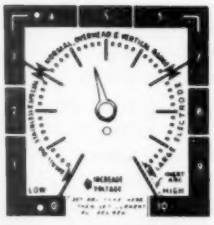
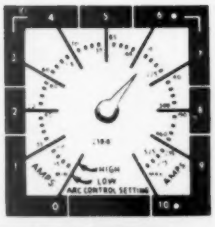
Gives You REMOTE CONTROL of CURRENT and TYPE of ARC

Right at your fingertips—exact control—compact, light weight for truly versatile performance



SELECTION OF ARC TYPE

for different welding jobs, and adjustment necessary to suit your individuality and the welding job.



DUAL CONTINUOUS CONTROL

in a rectifier welder. Can vary the current from minimum to maximum, and vary the type of arc, with continuous stepless self-indicating dials.

*TRADEMARK

Even in those tight, cramped places, where there's hardly room to turn around, this handy little remote control box goes right with you. No matter what your welding position, you can "dial" the exact arc you need, without running back to the welder to change range switches and taps. Only the Vickers CONTROLARC gives you this individual control of current and type of arc in convenient remote control operation.

AND ONLY THE CONTROLARC GIVES YOU THESE EXCLUSIVE OPTIONAL FEATURES

Constant Potential (CP) Adaptor • Slope Controller

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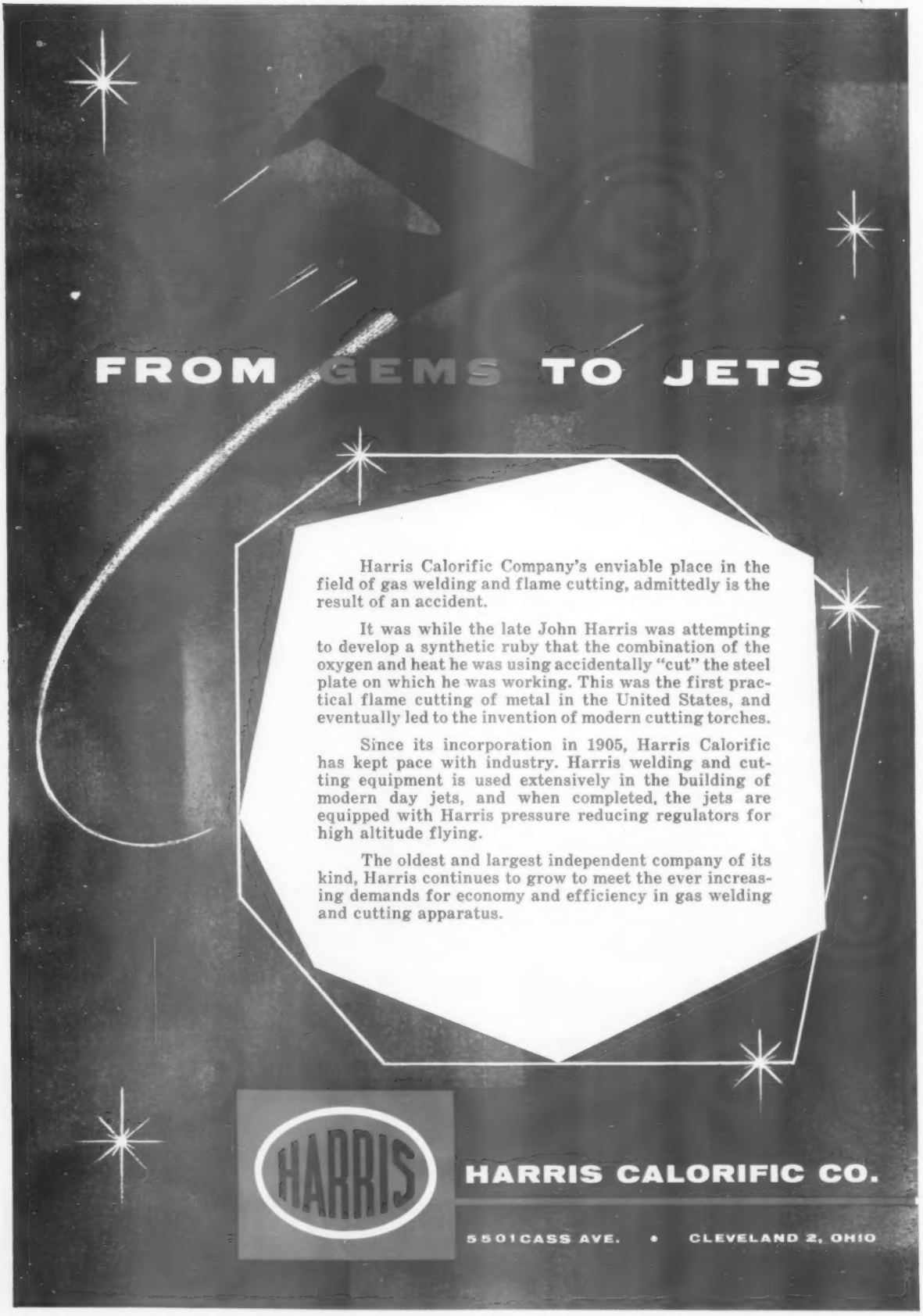

FROM GEMS TO JETS
Harris Calorific Company's enviable place in the field of gas welding and flame cutting, admittedly is the result of an accident.
It was while the late John Harris was attempting to develop a synthetic ruby that the combination of the oxygen and heat he was using accidentally "cut" the steel plate on which he was working. This was the first practical flame cutting of metal in the United States, and eventually led to the invention of modern cutting torches.
Since its incorporation in 1905, Harris Calorific has kept pace with industry. Harris welding and cutting equipment is used extensively in the building of modern day jets, and when completed, the jets are equipped with Harris pressure reducing regulators for high altitude flying.
The oldest and largest independent company of its kind, Harris continues to grow to meet the ever increasing demands for economy and efficiency in gas welding and cutting apparatus.
HARRIS
HARRIS CALORIFIC CO.
5501 CASS AVE. • CLEVELAND 2, OHIO

BETWEEN PASSES

aluminum tanks

The two aluminum water tanks described in this issue grace the landscape of Kaiser Aluminum's new rolling mill at Ravenswood, W. Va. The mill began initial operation just about the time the story was being written. Other articles in this issue that will be of special interest to you: the acetylene side of the acetylene-propane controversy; projection welding of air conditioners, and a comprehensive piece on two resistance processes, spot and projection welding. Seam and flash welding methods will be covered in April.

road show

We visited the American Road Builders Show recently, and it was heartening to see all those welded products. Held in Chicago's International Amphitheatre, the extravaganza (for that's what it really was) attracted visitors from 60 foreign nations. It was the first such affair in 10 years.

staff changes

Welding Engineer is pleased to announce the promotion of Jack Fairlie to managing editor—a position left vacant since 1954. Jack, who has been with us almost two years, was associate editor and is a key member of the editorial staff. Along with this good news, we must report some bad. Robert Kular, an assistant editor since his graduation last June from the University of Illinois, left for Army duty on Feb. 12. Bob thus becomes the first editor we've had on military leave of absence in some time. We are still looking for his replacement; anyone interested?

welding and the Bible

Welding has been placed in illustrious . . . nay, *sacred* . . . company. When R. G. LeTourneau recently announced re-entry into the earthmoving equipment field, his three-plank platform was published in some sections of the daily press. The planks: speed, the welding torch, and the Bible. According to one release, LeTourneaus's "pioneering tradition dates back to the early 1920's when, as a young man in his thirties, he began building land-leveling machinery by the then revolutionary process of welding."

"Yeah . . . Walt and I are in business together. I handle the work—and Walt gives customers the business!"

welding show

It won't be long before we hope to see many of our readers at the fifth annual welding show. Don't forget to drop in at our booth (No. 111) at Philadelphia's Convention Hall, April 9-11. We'll be looking for you. Anent this same topic: we see where the 1959 show is returning to Buffalo (for the *third* time). The 1960 affair may be held on the west coast, some reports say.

huge sums . . . but

The Advertising Federation of America reports that in 1955 an estimated $9,200,000,000 was invested in all forms of advertising in the United States. Despite some large spenders, a major part of the investment was made by the many smaller advertisers—retail stores, auto shops, etc. However large this sum, it represents only 2.5% of our gross national income and about 1% of all sales transactions. The advertising pages in *Welding Engineer* help make possible a larger volume of sales which, in turn, makes possible lower costs through mass production . . . all of which benefits you, the consumer.

old home week

That's what it was like in our offices a few weeks back when we received a news release concerning the Missouri River's hydroelectric generating station at Fort Peck Dam, Montana. Ted Jefferson was chief welding engineer on that job back in the '30s. Much of the equipment mentioned in the release was built by Ted and his crew.

inquiry cards

We plead, and plead, and plead . . . but still a small number of our readers continues to return inquiry cards that are worthless. Why are they worthless? *Because they have no return addresses.* So if you've sent us an inquiry card and haven't received an answer, remember, it may be because you neglected to complete the card.

familiar byline

How many of our readers recognized a familiar byline in our February issue? The former managing editor of *Welding Engineer* contributed a top article last month. Clyde B. Clason was the author of "Welding turns out boilers in a package," which described fabrication methods at York-Shipley, Inc. Clyde, incidentally, now lives in York, Pa.

let's dance

Talk about misdirected publicity releases! We received one from Music Corp. of America, the booking agency, giving us advance notice on availability of two dance bands —Les Elgart's and Blue Barron's. Sure, they're famous orchestras, but can they weld?

Lincoln engine welders have

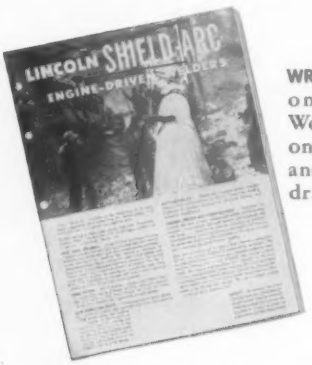
STAMINA

9 out of 10 contractors say Lincoln Shield-Arc's can take it . . . and dish it out

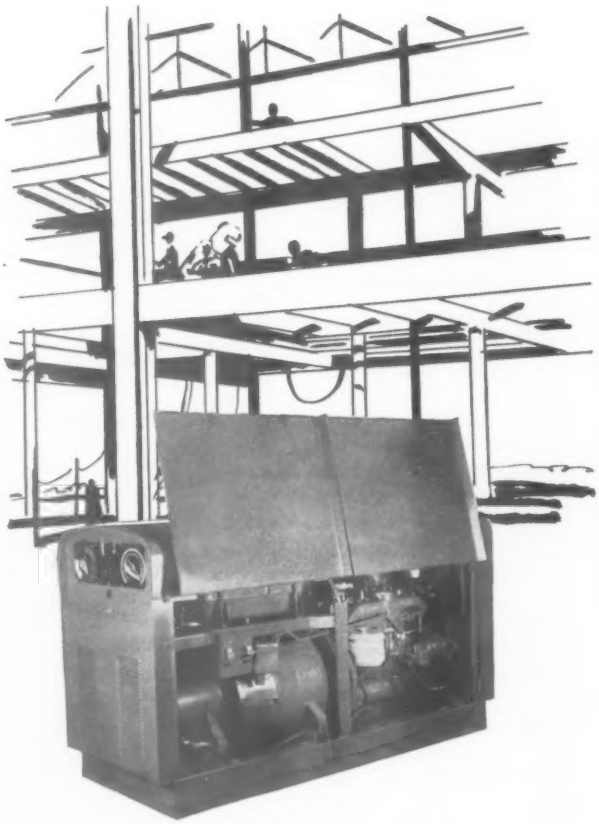
- **SLOW SPEED ENGINES for long life**
- **Heavy-duty, rugged design**
- **Extra overload capacity**
- **Close speed regulation and current control**

Gasoline engine driven models in 200, 300, 400, and 600 amp sizes.

Diesel engine driven models in 250, 300, and 400 amp sizes.



WRITE FOR SPECIFICATIONS on Lincoln Shield-Arc Welders. Bulletin SB-1356 on diesel driven welders and SB-1337 on gasoline driven models.



THE LINCOLN ELECTRIC COMPANY

Dept. 1726 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

MARCH, 1957

Welding Engineer

ESTABLISHED 1916

A nosegay to an industry

THIS MONTH, the movie industry will be giving "Oscars" to outstanding film productions, and to actors and actresses. The television industry will present "Emmies" for top performances on the video circuit.

It would therefore seem appropriate for the welding industry to so honor outstanding industry performers. And our nomination for "Best Welding Performance of 1956" goes to the roadbuilding and earthmoving equipment industry.

Had such a custom been established years ago, the petroleum industry would have won enough orchids to branch into the florist business. This important segment of industrial America learned early that welding was necessary if the earth was to give up its oil—and if that oil was to be converted into other indispensable products.

Welding was first applied to pipelines . . . then someone hardfaced a drill bit . . . then along came more welded pipelines. Before long, almost every item in the production end of the oil industry was welded—drill rigs, pump jacks, hoists, boilers.

On the refining end were welded tanks and pressure vessels, welded cracking towers and piping. It was in the refinery, incidentally, that demands for high-pressure, high-temperature operations nearly brought the oil industry to a standstill until welding was pounced upon as the only logical metal-joining method.

Acceptance was slow among oil industry fabricators, but years of association have taught these men the value and reliability of welding.

THERE is now a revolution in the earthmoving field. The horse-drawn slip scraper and the man-on-the-shovel did their job, but rapidly gave way to the two-wheeled scraper, the steam shovel and the tractor. One tractor scraper today will move more earth in one trip than a man with a scraper could move in days.

But these huge and powerful machines are not moving earth at a phenomenal rate just because of their mass and their horsepower rating. They meet deadly operational stresses every day of their service life. Those who design roadbuilding equipment took this into consideration when they began to specify welded joints.

A vivid demonstration of the strength and mobility of modern welded earthmoving equipment gave the public a treat and a lesson at the recent Road Builders Show in Chicago.

Off-the-road trucks, tractors, cranes, scrapers, draglines and bulldozers were jammed into every corner of Chicago's cavernous Amphitheatre. This equipment showed welds of every description: a few that could have been improved upon, but a vast majority that were adequately designed for the loads to be placed upon them.

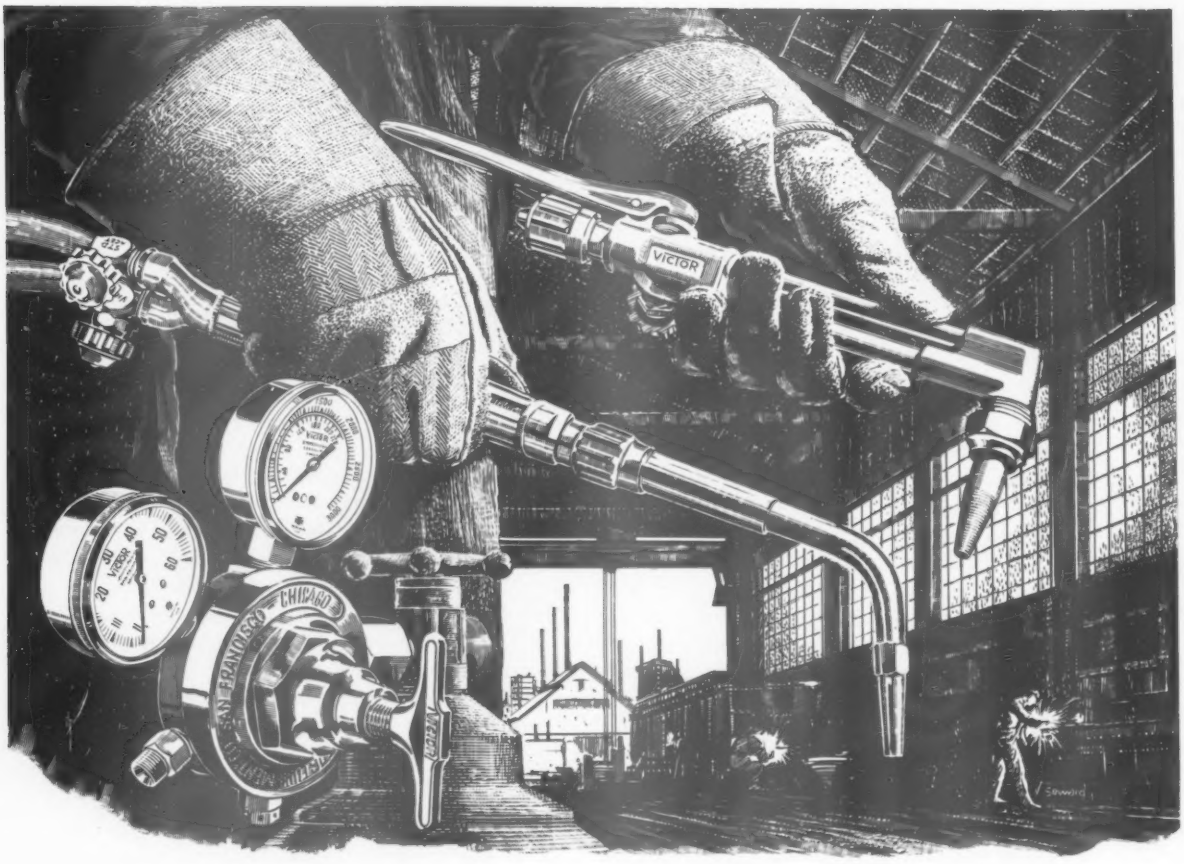
THE roadbuilding equipment industry obviously knows that good design means the most efficient use of weld metal at a minimum of cost.

The manufacturer of this heavy machinery learned to build ruggedness into his equipment through the hard lesson of customer service demand. He quickly found that welding was the easiest process to use in fabricating equipment that "stayed together" on the job.

When you spot a construction project using modern equipment, stop and examine the many examples of welded design that are being put to a severe test. You will find designs intended solely for *welding*, not sloppy adaptations to meet temporary requirements.

The welding job that these manufacturers are doing today is giving the contractor machines that are more durable . . . more pleasing in appearance . . . lighter in weight . . . and often less costly in proportion to work capacity.

For leading the way toward better uses for welding in 1956, we tender a nosegay of orchids to the roadbuilding equipment industry.



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FOR EASE OF HANDLING DIFFERENT JOBS . . . Welding, brazing, hardfacing, heating, heat treating, descaling and paint burning. Cutting, trimming, deseaming and weld scarfing.

WITH A WIDE VARIETY OF NOZZLES, TIPS AND CUTTING ATTACHMENTS, with quick-change, hand-tight, time tested sealing ring connections.

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VICTOR for welding

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Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

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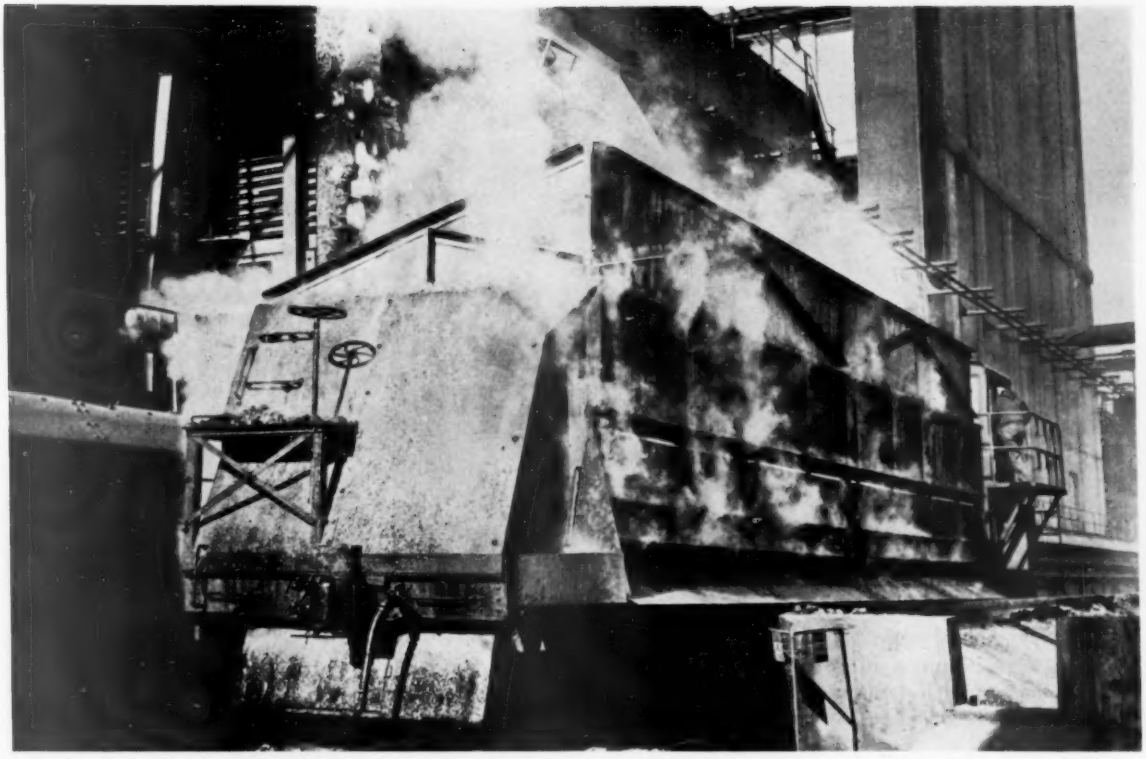


HOT coke is pushed from oven into coke-quenching car. Car immediately moves down tracks to quenching tower where water cools coke. Welded studs for car's steel floor plates helped offset damage caused by abrasive and corrosive action, and thermal shock effect.

Stud welding is good medicine for coke-car floor plates

A NEW USE for stud welding, devised by maintenance shop supervisors at U. S. Steel's Fairless (Pa.) Works, is netting significant savings for the plant.

The mill's central maintenance shop acts in both a scheduling and "troubleshooting" capacity. Its planning office sets up the program under which all necessary equipment maintenance is carried out, and equalizes the workload in various shops under the department's supervision.

Early in 1955, the planning office launched a detailed study of maintenance operations on coke-quenching cars—the work horses of all integrated mills.

Coke Stock Pile

Approximately 243 times in a 24-hour period, two cars on continuous duty at Fairless are loaded with 12½ tons of flaming coke and sped to a quenching tower where water decreases the cargo's 2,100-F temperature.

The load is then dumped and conveyed to a stock pile or transported directly to blast furnaces. Major problem was the number of times coke-quenching cars had to be removed from duty for repair.

Eroded Bolts

Steel floor plates were severely damaged by abrasive action of tons of coke smashing against floor surfaces; by corrosive action created during quenching, and by thermal shock effect of high-temperature coke suddenly being cooled.

This heavy wearing action necessitated complete treatment of floor plates every 15 or 16 weeks. The sixteen ¾-in. plates were installed by drilling and countersinking holes, and inserting ¾ by 2-in. bolts.

In most instances, bolts were sheared-off or eroded by acid action. With these fasteners gone, plates warped and pulled loose. The car needing repair was pulled off the line and a standby car was pressed into service.

Because of bolting, new plates had to be transferred from one shop to another for various make-ready operations. Several plates could be gang-drilled, but each countersunk hole had to be made individually. Plates were flame-cut to size in the structural shop, then taken to the machine shop for drilling and countersinking.

The final step was to ship them to the coke works as spares so that car down-time could be reduced.

The maintenance department's first

LEFT: Absence of bolt holes and use of ¾-in. welded studs provide uninterrupted floor surface for coke-quenching car. Therefore, leakage is held to a minimum. BELOW: Underside of car shows location of studs through supporting members. Studs were installed using simple template. Shop cost of repairing cars has been cut considerably through use of this welding technique.

move was the substitution of T-1 steel for the standard high-strength plate type. T-1 was chosen for its durability, high abrasion resistance and strength.

Steel Quality

Length of floor-plate service between repairs was immeasurably increased, but not enough to realize appreciable savings in shop and operating costs. Therefore, steel quality was not the determining factor in this maintenance problem.

The planning department turned its attention to the plate-fastening method. Improved techniques for countersinking holes were considered, tried and discarded.

Early in 1956, the department felt a solution might lie in stud welding plates to car chassis.

KSM Products, Inc., of nearby Merchantville, N. J., was asked to have its engineering department work with Fairless personnel in exploiting stud welding possibilities for this application.

Success Assured

Laboratory experiments indicated stud welding was practicable. The weld developed full strength; in tensile tests, failure occurred in the steel —at 80,000 psi.

The application was first used in January, 1956. Two center floor plates were removed from a coke-quenching car and re-fastened by welded studs. Passing months proved the method completely successful.

"Coke works maintenance reported only six studs in the test car worked loose," said the planning office supervisor. "On plates fastened by bolts, the loss of fasteners would have increased at least six times in the same period, and plates would have been replaced at least once."

Nearing completion is a reconditioned coke-quenching car in which the maintenance department is using stud welding for all floor plates. The car will be equipped with mild-steel plates, based on a theory that better fastening will give longer life even with less specialized steel.

Minimum Leakage

Fairless people list three advantages anticipated in the stud welding application.

(1) Since plates form an uninterrupted floor surface, leakage will be held to a minimum. Service life of chassis should be extended considerably.

(2) Operating time of cars before floor plates must be changed will be increased about 50%. It is estimated that, by increasing number of studs per plate, even greater operating times may be achieved.

(3) Shop cost of repairing a car will be cut considerably. Plates are floor-cut to size in the structural shop and studs are welded in minutes. Plates are then shipped to the coke works as spares.

Man-hour savings through elimination of drilling, countersinking, handling and assembling are considerable. Further savings due to extended plate life and increased car service between repairs are also expected.

Uses Extended

Success of stud welding on coke-quenching cars has prompted investigation of this fastening method for other sections of Fairless Works.

Welded studs are now used as plate fasteners on skip cars for blast furnace operations; on wear plates for a pickling line where steel is cleaned prior to cold reduction, and on anchor bars in curb angles.

Part: I

A background for evaluation of acetylene and propane

—Courtesy Linde Air Products

FLAME-scarfing: Could propane provide economy and efficiency in such an operation?

By J. Okladek
Development & Engineering Dept.
Canadian Liquid Air Co., Ltd.
Montreal, Canada

In the first of two articles, Mr. Okladek lays groundwork for his comparison of acetylene and propane as fuel gases. He's on the acetylene side in a controversy stirred in February, 1956, by Jay Bland's article, "Comparative testing confirms oxypropane cutting value." Don't pass up this highly-informative presentation . . . and watch for Part II in a forthcoming issue.

TO MAKE a true comparison of oxy-acetylene and oxypropane flames, it is necessary to remove oxygen and examine major properties of the fuel gases.

Acetylene is a hydrocarbon gas produced by the reaction of water and calcium carbide. This latter substance is made by fusing lime with anthracite, or some qualities of coal, in an electric furnace.

Calcium carbide is a hard, crystalline substance, dark gray in color. Its molecule is composed of 1 atom of calcium; combined carbide contains 5 lb of calcium for every 3 lb of carbon. Specific gravity is 2.25, and 1 cu ft of crushed material weighs 136 lb.

Calcium carbide will not explode or burn unless combined with oxygen and heated to a high degree. It is generally packed in airtight containers to prevent ordinary moisture of the atmosphere from slowly slaking it and rendering it useless.

Acetylene Production

Lime used to produce the original carbide comes out of an acetylene generator as waste (sludge). Calcium carbide acts as a vehicle to convey carbon, and to cause its combination with hydrogen in water to form acetylene.

There are two types of acetylene generators currently employed: "carbide-to-water," used almost exclusively in North America, and "water-to-carbide," more popular in Europe. The former can be classified into two categories: low-pressure, operating at less than 1 psi, and medium-pressure operating at pressures between 1 and 15 psi.

When using a carbide-to-water generator, actual consumption figures of carbide and water are usually estimated as follows: 1 lb of calcium carbide mixed with one U. S. gallon of water produces approximately 4.5 cu ft of acetylene, 1.15 lb of dry hydrated lime and 7.6 lb of water.

Since acetylene generation produces considerable heat, volumetric rate of generation is often limited to 1 cu ft of acetylene per hour per pound of carbide in single-rated generators, and to 2 cu ft in double-rated generators (which use smaller-size carbide).

At temperatures above 1,435 F, or pressures above 30 psi gage, the gas is unstable. Any shock or additional heat may start an explosive decomposition.

For this reason, limits are set on the pressure at which acetylene may be used as a free gas. In North America, use of free acetylene at pressures over 15 psi is forbidden; in England, the limit is around 9 psi . . . in France, 22 psi.

Limits of flammability given in Engineering Data Sheet No. 198 with this article have been determined at atmospheric pressure. The lower limit is unchanged when increasing pressure to 75 psi. The higher limit rises almost linearly from 80 to 100% as pressure is raised from atmospheric to 7 psi above.

Flammability of richer mixtures is evidently assisted by exothermic decomposition of much of the acetylene that is not burned. The 100% acetylene transmits flame by this means entirely.

A source of ignition developed locally in a medium-pressure generator

—Courtesy Air Reduction Sales Co.

AUTHOR Okladek feels propane has only limited usefulness in silver-brazing (above) because it lacks "unique reducing properties" of the oxyacetylene flame.

Data Sheet No. 198 is a part of this article

may thus cause an explosion of the gas, even with an absence of air. Final products of decomposition are largely hydrogen and carbon.

Sensitive to Shock

Liquid acetylene (obtainable only under pressure) and solid acetylene are actually explosives sensitive to the slightest shock. Acetylene gas, however, may be stored and transported safely under pressure when compressed into cylinders containing a porous mass soaked in a solvent.

The porous filling may be charcoal, kapok, or a monolithic compound of asbestos. Acetone is generally used as the solvent in which acetylene gas is dissolved under pressure. Acetylene, however, comes out of acetone freely when the cylinder valve is opened.

Acetone is a flammable liquid which can absorb 25 times its volume of acetylene at atmospheric pressure, and 420 times its volume of acetylene at 250 psi pressure.

In North America, various cylinder sizes hold from 60 to 300 cu ft of gas at a full-load pressure of approximately 250 psi and a temperature of 60 F. Cylinder pressure varies greatly according to temperature, and may drop fairly quickly as the cylinder is discharged. It will partly recover as pressure distribution in the cylinder normalizes.

Because of this behavior, the pressure gage on a cylinder regulator is *not* a reliable guide to acetylene volume in the cylinder. Gas volume in a dissolved acetylene cylinder is best calculated by weight.

One cu ft of acetylene weighs 1.1 oz; 14½ cu ft weigh 1 lb.

Acetylene is taken from the cylinder through a regulator which reduces pressure to job requirements, and to suit characteristics of particular tips being used.

Cylinders of dissolved acetylene can be used singly for light and medium steel cutting, or manifolded for heavier cutting when demand exceeds maximum rate of discharge of a single cylinder. It is not desirable to discharge an acetylene cylinder at a rate greater than 20% of its full capacity per hour (*e.g.*, 50 cu ft per hour from a cylinder holding 250 cu ft of acetylene).

The Hottest Flame

A higher rate of discharge can cause acetone to be brought out with acetylene, weakening heating power of the flame. Actually, however, there is always a certain amount of acetone in acetylene drawn from a cylinder of dissolved acetylene.

This quantity is negligible when the cylinder is full, but increases with a decrease in cylinder pressure. When pressure is less than 50 psi, the acetone will influence the flame.

Acetylene is a highly combustible gas containing 92% carbon by weight —the highest percentage of carbon in any hydrocarbon gas. This gives an oxyacetylene mixture the hottest flame (5,900 F) of any commercially-used gas.

Not only is the oxyacetylene flame temperature higher, but rate of combustion is very rapid. Secondary flame reaction keeps the intense heat localized, and there is low heat loss in the outer flame envelope.

Theoretically, an oxyacetylene flame is called *neutral* when the burning mixture contains an equal number of oxygen and acetylene molecules. Actually, due to impurities, a neutral flame requires 10% more oxygen than acetylene. This combustion takes place in the flame's inner cone.

Carbon monoxide and hydrogen produced by combustion combine with oxygen in the surrounding atmosphere. This occurs in the flame envelope. Such a flame has reducing properties very useful for welding, and results in a weld free from carburized and oxidized metal. It is also easy to adjust; little experience is needed to obtain a neutral flame.

Source of Propane

Propane is one of a group of hydrocarbon gases, all by-products of the petroleum industry. Main source of this gas is crude oil gas mixtures from oil and natural gas wells. It is also produced in certain oil-refining processes and from the recycling of natural gas.

The propane molecule is composed of 3 atoms of carbon, 8 atoms of hydrogen, and the gas contains 82% carbon by weight. Since it liquefies at relatively low pressure, propane can be stored in liquid form.

Propane is generally stored in large tanks placed on concrete blocks and filled by tank cars or trucks. The liquid gas is then transfilled into cylinders. A typical installation includes liquid pumps, compressors, vacuum pumps and filling ramps with scales for weighing cylinders while they are being filled.

A propane cylinder is filled only

Properties of acetylene, propane and oxygen

	Acetylene	Propane	Oxygen
Molecular formula	C_2H_2	C_3H_8	O_2
Molecular weight	26.036	44.094	32
Hydrogen content (% by weight)	7.7	18.3	—
Carbon content (% by weight)	92.3	81.7	—
Specific gravity: liquid (water 1)	—	0.509	1.132
Gas (air 1)	0.9056	1.531	1.105
Weight: lb per gal of liquid	—	4.238	9.446
per cu ft of gas	0.0692	0.1162	0.0846
kg per liter of liquid	—	0.509	1.132
per cu meter of gas	1.091	1.846	1.32
Volume: cu ft per gal of liquid	—	36.45	113
per lb	14.45	8.604	11.82
liters of gas per liter of liquid	—	276	843
per kg	917	542	744.7
Melting point at atmospheric pressure	—	—310F	—361.1F
	—	—190C	—218.4C
Boiling point at atmospheric pressure	—	—48.1F	—297.3F
	—	—44.5C	—183.0C
Sublimation point at atmospheric pressure	—119F	—	—
	—83.8C	—	—
Critical temperature *(above which gas cannot be liquefied by any pressure)*	96.6F	206.6F	—180.4F
	35.9C	97C	—118.0C
Critical pressure *(required to liquefy gas at the critical temperature)* (psi):	906	648.1	725
(kg/cm²):	63.7	45.56	51.4
Heating values: Btu's per lb	21,387	21,690	
per cu ft of gas	1,483	2,509	
per gal of liquid	—	91,890	
Calories per kg	12,000	12,120	
per cu meter of gas	13,100	22,400	
per liter of liquid	—	6,190	
Flame temperature: with air	4,770F	3,840F	
	2,632C	2,116C	
with oxygen	5,900F	4,900F	
	3,260C	2,704C	
Lowest auto-ignition temperature	635F	874F	
	335C	468C	
Limits of flammability in air			
At atmospheric pressure: (lower limit):	2.5%	2.3%	
(higher limit):	80.0%	9.5%	
In oxygen: (lower limit):	3.1%	2.3%	
(higher limit):	90.0%	55.0%	
Detonation limits: In air (lower limit):	4.2%	—	
(higher limit):	50.0%	—	
In oxygen (lower limit):	3.6%	3.1%	
(higher limit):	92.0%	37.0%	
Maximum detonation pressure: gas & air at 0 psig	2,300psi	—	
gas & oxygen at 0 psig	1,400 "	—	
gas & air at 15 psig	3,800 "	—	
gas & oxygen at 15 psig	2,900 "	—	
Maximum rate of flame propagation in air (ft/sec):	11.0	2.69	
in oxygen (ft/sec):	330	60	
Cu ft of air needed to burn 1 cu ft of gas:	12	24	
Cu ft of oxygen needed to burn 1 cu ft of gas:	2.5	5	
Cu ft of oxygen needed for a neutral flame:	1.1	4	

Vaporization rate (cu ft per hour) of a 100-lb propane cylinder

Propane (lb) in cylinder	O F	10 F	20 F	30 F	40F	50 F	60 F	70 F
100	45.5	55.7	67	77.3	85.5	94.5	111	120
90	42	51.5	60.9	70	80	85.8	103	111
80	37.8	46.4	54.9	63.5	72	80.6	85.8	94.5
70	33.5	41.3	48.9	56.6	64	72	79.6	85.8
60	30	36.9	43.6	50	56	63.5	70.4	77
50	25.8	31.8	37.8	43.6	50	55.8	61.7	67
40	22.3	26.8	31.7	36.9	42	47.4	52.4	56.6
30	18	22.3	26.6	30.9	34	38.6	43	47.2
20	14.6	17.3	20.6	24	27.5	30	33.4	36.9
10	11.3	12.9	15.4	17.3	19.7	22.3	24	26.6

to a certain level, which is dependent on temperature (85% of full capacity at 80 F), in order to allow expansion if temperature is raised. Remaining space in the cylinder is occupied by propane gas.

Propane cylinders, depending upon size, contain between 23 and 100 lb of liquefied gas; 1 lb of liquid propane gives 8.6 cu ft of gas.

Vapor Pressure

Liquid propane vaporizes inside the cylinder until pressure created by the gas is sufficient to keep the rest in a liquid state. This pressure varies with the temperature, as follows:

at 20 F, vapor pressure is 41 psig
at 40 F 63
at 60 F 92
at 80 F 128
at 100 F 172
at 120 F 225

When propane gas is withdrawn from a cylinder, pressure on top of the liquid decreases, allowing some liquid to vaporize. Vaporization requires 680 to 820 Btu's per gallon, or 160 to 190 Btu's per pound of transformed liquid, depending on its temperature. This heat is supplied by surrounding atmosphere.

When the cylinder is full, area of cylinder wall separating liquid propane from atmosphere is larger, and a greater quantity of propane may be drawn off. When the cylinder is almost empty, area of metal surface in contact with the liquid propane is greatly reduced and less gas should be drawn.

Atmosphere temperature is of prime importance, since the number of Btu's supplied is directly proportional to the difference in temperature between liquid and atmosphere.

When making an installation where peak load of propane consumption is known, one must consider the lowest possible temperature which will affect cylinders. How much propane a customer is willing to leave in containers must also be considered.

For instance, let us say a propane manifold is installed in an unheated room where temperature may drop to 10 F. Maximum propane consumption is 500 cfh, and the customer is willing to lose 10 lb of propane in each 100-lb cylinder.

Theoretically, 38 cylinders would be required. In actual practice, however, this number may be greatly reduced by installing the manifold in a heated room, or by allowing more gas to stay in cylinders for further use in the plant.

The oxypropane flame is oxidizing when more than 2 volumes of oxygen are mixed with each volume of propane. For most applications, a 4 to 1 ratio is preferred because it gives highest flame temperature. However, a correct flame setting to obtain that ratio is very difficult, and few operators can tell whether an oxypropane flame is burning 5 parts of oxygen for 1 part of propane, or only 3 to 1.

Flammability Limits

Limits of propane flammability given in the Data Sheet have been determined at atmospheric pressure. The lower limit is unchanged when increasing pressure. The higher limit rises to 17% at 170 psi and to 24% at 280 psi.

Many comparisons have been made between acetylene and propane. Some consider only the number of Btu's produced by burning 1 cu ft of each gas. Others take only flame temperatures into account.

More recent comparisons are based on heating value and burning velocity, or rate of flame propagation, of the mixed gases. For a certain mixture of a given gas, heating value, flame temperature, and burning velocity are fixed.

Nevertheless, we have seen contradictions resulting from comparisons made with similar mixtures. We must, therefore, admit there is another factor which influences heating power of these flames.

Comparison Procedure

To make a true comparison of heating properties of oxyacetylene and oxypropane flames, the following procedure was adopted:

1. Determine whether or not the flame should be reducing. The oxyacetylene flame has unique reducing properties which make it preeminent in welding, useful in silver-brazing, but of no great advantage in cutting. This rules out the possibility of propane for welding, and limits its applications in silver-brazing. In the fields of flame-cutting, flame-hardening, furnace heating and others, the question should be solved by the steps which follow.

2. Determine the number of Btu's required by each flame to bring the metal to a desired temperature. Remember that, of the total Btu's delivered by each flame, only a certain portion goes into the plate; the rest is wasted in the atmosphere. Of the portion going into the plate, a certain percentage is wasted because the unheated part of the plate draws heat from the locally-heated area. This percentage depends on type of metal, temperature, and length of time the heat has to be applied in order to reach desired temperature. To waste as little heat as possible, Btu's must be transferred into the part of the metal to be heated as fast as possible. Therefore, it is the number of Btu's conveyed per second into each square inch of metal to be heated that determines the efficiency.

3. Once the number of Btu's required to bring metal to desired temperature has been determined for both gases, quantity of gas required can be easily deduced.

4. Knowing that an oxyacetylene flame requires 1.1 times more oxygen than acetylene, and an oxypropane flame four times more oxygen than propane, the quantity of oxygen required is easily found.

5. The price paid by the user for his oxygen, acetylene and propane will be the last deciding factor.

"Unionarc"--

Something new for mild steel welds

By a Staff Member

TO THE LONG list of welding processes, a new name must now be added—"Unionarc."

Linde Air Products Co. unveiled this semiautomatic arc welding process at a press conference for industrial editors on Jan. 22, 1957, at its Newark, N. J., laboratories. There will be a public demonstration at the AWS welding show in Philadelphia, April 9-11.

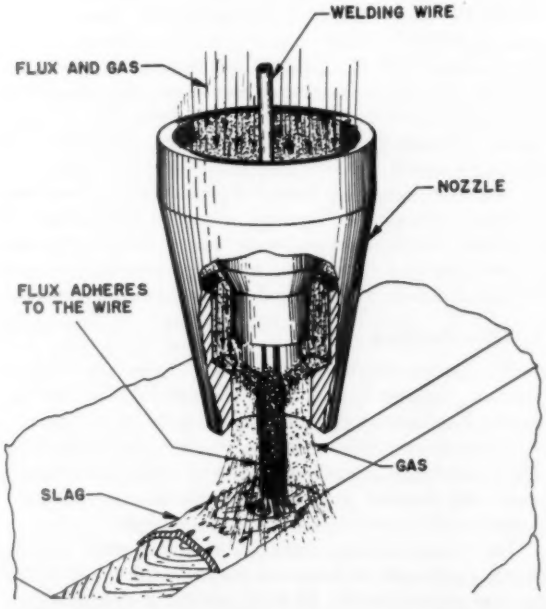
(WELDING ENGINEER readers were informed of this new welding method as early as November, 1956, in the *WeldWorld* late-news page.)

Inventor of Unionarc is Harry E. Kennedy, who also developed the submerged-arc welding process.

Designed primarily for mild steel welding, Unionarc employs a continuously-fed bare wire electrode, a powdered, magnetizable flux, and carbon dioxide gas.

Powdered flux, fed from a hopper, is magnetized on a rotating drum and carried in a CO_2 gas stream to the welding nozzle. With welding current on, a magnetic field is established around extended portions of the welding wire. Flux coats this exposed wire just before it enters the arc, where it melts to refine weld metal and shield it from atmospheric contamination.

FOUR-wheeled cart holds complete Unionarc assembly. Wire reel lays on rotating turntable; welding control unit is fitted in case under cart handle. Gas-carried flux is fed through clear tube.



CUT-AWAY view of welding nozzle shows distribution of flux carried by carbon dioxide and its adherence to welding wire between nozzle and weld. CO_2 also protects molten weld metal from contamination.

Electrode wire is fed from a 300-lb-capacity reel that is supported and rotated on a turntable driven by a special d-c shunt motor. Motor speed is controlled so that wire tension at feed rolls is minimized. The wire pack and its driving motor, together with the flux dispenser assembly and other welding control elements, is mounted on a small, four-wheel cart for mobility.

Three components combine to provide adjustable and constant flux supply: the hopper, a magnetic drum and a gas-flux control valve.

Controlled Flux

Pressurized by gas at 4 psi, the hopper body can be screwed in or out of the dispenser unit to control flux quantity. When the hopper is tightened, the flux orifice is close to the magnetic drum and less flux is delivered. A calibrated ring on the hopper shows orifice position and permits rapid adjustment of flux-flow rates.

As flux is released from the hopper, it is picked up by a magnetic drum revolving beneath the orifice. A rubber scraper under the drum removes the magnetized flux and it falls into a distributing chamber. Here it is suspended in the CO_2 stream and carried through the same tube to

the shielded-arc-type torch.

Elements of the gas-flux control valve are a four-way gas solenoid valve, a check valve and a flux pinch valve. A two-button switch on the welding gun controls the gas solenoid valve, which is designed to instantly provide a usable gas-flux mixture when welding begins.

Equipment needed for Unionarc welding includes an air-cooled welding gun, a power source, the flux dispenser assembly, a welding control unit, and the basic mechanical assembly.

Used in Linde performance tests during the development period were a welding gun rated at 450 amp (continuous duty), and a d-c constant-potential rectifier welder. The latter provided uniform starting and arc-control characteristics.

Welding Control

A constant-speed unit designed for Unionarc operation controls wire-feed rate, current contactor operation, the gas solenoid valve and the wire reel drive motor. During welding, an electronic governor provides constant wire-feed rate, and the power supply unit varies arc current to compensate for changes in arc length.

Through this action, wire is deposited at slow or fast rates, depending on arc length, and the arc is always returned to the pre-set value.

Electrical components of the welding control unit are mounted on the cabinet door for easy examination and replacement. External connections are made by plugs on both sides of the control cabinet.

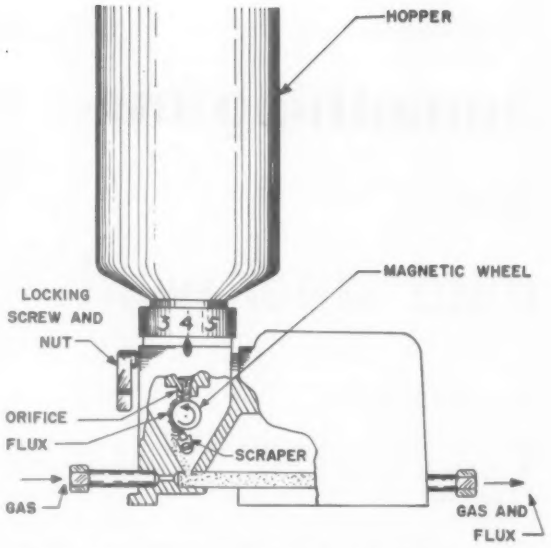
Comparisons with coated electrode welding were made in three production phases during development of Unionarc: weld metal deposition, speed and cost.

Both 3/32 and 3/64-in. wire were used in deposition tests for the new process. Coated electrodes used were ¼-in. E6012's and 3/16-in. 6024's. A chart with this article indicates that deposition rate for Unionarc matched the wire-feed rate.

Also shown in this chart are other factors which contribute to production welding costs. Linde assumed a labor rate of $2 per hour and an overhead rate 1½ times this figure. Operating factor for coated electrode welding was fixed at 40%; the firm assumed a 50% operating factor for the new process, because time needed to change electrodes could be eliminated.

Data for ¼-in. horizontal fillet weld

	E6012	E6024	Unionarc
Rod size (in.)	¼	3/16	3/32
Welding current (amp)	325 a-c	275 a-c	400 d-c (rp)
Welding speed (ipm)	10.3	13.4	20.0
Arc time (hr/100 ft)	1.95	1.49	1.0
Deposited metal (lb/100 ft)	13.6	13.1	13.3
Electrode consumption (lb/110 ft)	20.4	19.6	13.3
Flux consumption (lb/100 ft)	—	—	6.7
CO_2 consumption (cf/100 ft)	—	—	35



FLUX distribution assembly is simple to operate. Variable distance between hopper orifice and magnetic wheel determines flux quantity; calibrated ring sets ratio of flux to wire. Wheel magnetizes flux, which is then scraped off to fall into gas line. CO_2 carries powdered flux to welding gun.

Results of the Linde tests indicated that Unionarc welds with 3/32-in. wire could be made twice as fast—and at half the cost—of regular arc welds with ¼-in. E6012 electrodes. For comparable weld quality and appearance, Linde maintains that the new process is "at least 50% faster and 30% less expensive" than welding with E6024's.

Although wire of various diameters can be used with the new process, present equipment was designed around the 3/32 and 3/64-in. sizes. Linde feels that requirements of most applications can be met within this operating range.

The 3/32-in. wire is intended generally for downhand welding; the smaller-diameter wire can be used in all positions. Current range for the larger wire is approximately 350 to 450 amp, d-c reverse polarity. A ratio of 0.5 lb of flux to every pound of wire is recommended.

Cost Factors

All-position welds with the 3/64-in. wire are made at currents varying from 125 to 250 amp, d-c reverse polarity. Flux-to-wire ratio ranges from 0.3 to 0.6 lb.

Arc characteristics of Unionarc, says Linde, are similar to those of coated electrodes, and welding techniques used with the new process are comparable to those employed with common coated electrode types.

The entire welding machine, complete with welding torch, gas regulator, hose and control cables is expected to cost approximately $2,400. Admitting that this purchase price represents a large capital outlay, Linde nevertheless maintains that the higher operating factor, speed and versatility of the process will more than offset its initial cost.

LEFT: Addition to Pennington Garage. Trusses were fabricated from 2½-in. OD tubing with wall thickness of ⅜-in. Uprights were 4-in. OD tubes of same stock. Tubing was purchased in 10-ft lengths and manually arc welded into 40-ft sections with stainless electrodes. BELOW: View of Pennington addition in relation to older garage.

In Nebraska:

Father-son team builds welded garage addition

CONTENDING with Nebraska's fiery summer sun and frigid winters has been something less than a picnic for weldors Ivo and Walter Pennington. Size of modern automotive and machinery units have forced them to complete many repairs outdoors.

Their Wauneta job shop, Pennington's Garage, was built in 1923—a day when trucks longer than 20 ft, for example, were relatively uncommon.

To provide necessary space that would enable them to take this heavy equipment out of the weather during repairs, the father-and-son team devoted spare time to construction of a handsome and functional garage addition.

"By doing the work in our free time," Ivo points out, "we have not lost a dollar in productive work, and we've had the additional enjoyment of designing a structure that's new in this part of the country."

Low-Alloy Tubing

Much of the material that went into this building addition was purchased from war-surplus sources, so costs were kept to a minimum.

Trusses were fabricated from 2½-in. OD tubing with a wall thickness of ⅜ in. Uprights were 4-in. OD tubes from the same stock.

Tubing was purchased in 10-ft lengths and manually arc welded into 40-ft sections with stainless electrodes. Stainless was chosen to eliminate the necessity of preheating the low-alloy tubing.

Old automobile bearings bolted to benches rotated tubes for circumferential welds. When two 40-ft lengths had been completed, they were laid on the ground. Short pieces of angle iron, serving as diagonal truss members, were welded to one side with stainless electrodes.

Concrete Footings

The truss with half its diagonals in place was flopped for completion with the aid of a tripod and chain hoist. With all angles joined, 4-in. upright members were welded to a truss. When erected, the truss sloped ¼ in. to the foot while the upright remained vertical.

Concrete footings on which uprights were to be set had four ½-in. bolts imbedded in them. Similar-sized holes were flame-cut in a piece of ⅜-in. plate, which was then placed over the bolts and laid on the footing.

Manual power applied to two ¾-ton chain hoists raised trusses and their connected uprights. Rope from the hoist was snubbed around a post buried in the ground to serve as a *deadman* at a point directly beneath the desired truss position.

The moment a truss was in proper vertical alignment, uprights were welded to plates on the concrete footings. A 2½-in. tubing section was welded to each new truss, joining it to those raised earlier. Lighter tubing was then welded in place to complete the bridging.

Cement Block Walls

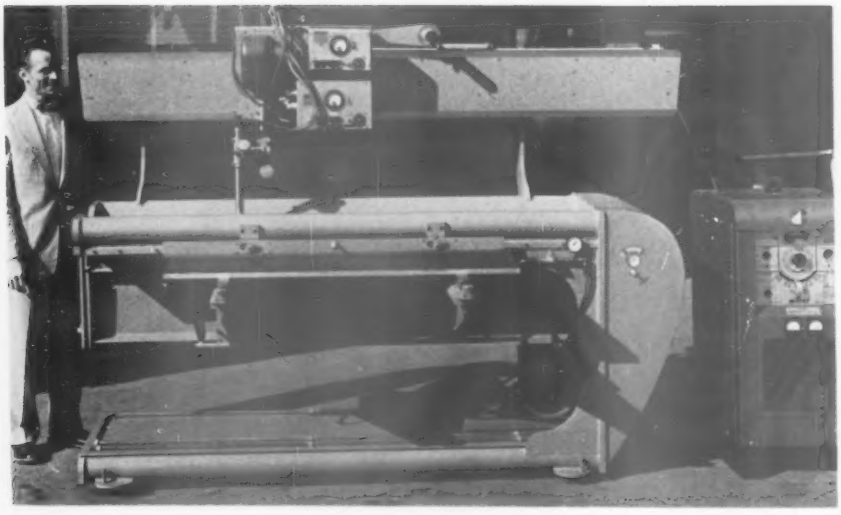
To secure an opening 20 ft wide in one wall, the vertical upright at that point was left unfastened. A 20-ft truss with 4-in. uprights was set in place to frame this doorway and the partially unsupported transverse truss was welded to its center.

Providing adequate support for the transverse truss when the unnecessary upright was removed were two ¾-in. rods. Threaded into sockets at outer edges of the doorway truss, they slipped under the end of the transverse truss to give strong lifting force.

Walls of the new Pennington addition are cement blocks, within which fit the 4-in. uprights. In the center of every 10-ft wall section is a steel sash for further reinforcement.

Heavy sheet metal, in 10, 20 and 30-ft lengths, was welded to the top of trusses to support the roof. Sections were also welded to each other on 3-ft centers. Lengths were alternated to avoid continuous splices.

Two doors with angle-iron frames and sheet metal panels were welded for the new addition. They were hung from a track welded to the 20-ft doorway truss. Built-up asphalt and felt above a double thickness of sheetrock insulation comprised the roofing material.



WELDING unit, fixture and power source used in thin-gage stainless application. Track for automatic Tig welding head is welded to machine. ***(At left is H. L. Meredith of Airline, co-author of* "Roll planishing gives improved joint efficiency," *Welding Engineer, Feb. 1957, p. 68.)***

The Tig process creates . . .

Welded "blankets" of ultra-thin stainless

By Byron R. Russell, *President Airline Welding & Engineering Hawthorne, Calif.*

WHEN MANUFACTURERS began ordering larger-size sheets of thin-gage 17-7PH stainless steel to blanket corrugated honeycomb material, a severe production problem had to be faced.

Even with their best equipment, rolling mills could not produce 0.0005-in. sheets of 17-7PH in widths greater than 18 in. The limit was 24 in. for 0.008 and 0.010-in. material. Yet, there was an immediate need for stainless "blankets" 54 in. square and larger.

Airline Welding & Engineering, with a backlog of experience in butt welding thin-gage materials, inaugurated a comprehensive study of the problem. The firm's engineers decided that existing automatic butt welding equipment, with some major modifications and improvements, could join strips of 17-7PH into required sheet sizes.

Special Fixture

An automatic, longitudinal welding fixture was designed especially for these thin stainless sheets. The unit is equipped with a concave back-up mandrel which is filled with argon gas during welding. Orifices in the mandrel permit some argon to flow along the underside of the weld seam, completing an inert-gas envelope and preventing oxidation.

An automatic Tig (tungsten inert-gas) welding head is mounted on the fixture. Power source is a transformer welder with superimposed high frequency.

A special table, mounted on rollers, carries aluminum sheet into the welding machine. The table is pushed firmly against sliding stops which are parallel with the welding groove and back-up bar. Vacuum pumps are then started to hold sheets firmly to the table. Even the slightest ripple cannot be tolerated during welding.

After sliding the stop out of the way, the rolling table is pushed inward until sheet edge is positioned over welding groove. Exact positioning is assured by an indicator mounted on the fixture. When the second sheet is butted against the first, both are clamped in place.

Slight Upset

As holding fingers move downward and inward to grip sheets in the clamping operation, sheets are forced so tightly together that a slight upset occurs. The closely-spaced holding fingers prevent edge distortion, and the minute amount of upset metal actually proves beneficial when welding begins.

Developing the fixturing and welding unit, however, was only one step on the road to production. Techniques for handling and shearing the very thin stainless material had to be devised.

The fragile material bent easily; the extremely fine finish obtained at the rolling mill had to be maintained, and shearing was necessary because the mill edge was not accurate enough for welding.

Three quality controls were established to cover the handling problem: (1) Gloves are worn at all times by everyone handling the stainless sheets; (2) sheets are never lifted; they are slid from pallet to machine and back again; (3) sheets are interleaved with paper at all times.

10-Ft Shear

The shearing operation had to result in an edge of optimum weldability, so a well-conditioned 10-ft shearing machine was adapted for the job. An extension table built in front of it allowed sheets to be kept flat at all times.

An aluminum hold-down bar clamped sheets at a distance of 0.002 in. from the shear blade. This bar prevented buckling during the cutting operation, minimizing shear stresses along the sheet edge. Experience had shown that the natural *bow* along the sheet edge could not exceed 0.003 in. throughout the 54-in. cut.

The 0.0005-in. stainless sheet comes from the mill in 18-in. rolls, and only about 1/16 to ⅛ in. of material must be removed to prepare sheets for welding.

For the joining operation, sheets are placed in the welding fixture as described above. The weldor, using an 8x magnifying glass permanently installed on the machine, strikes his arc. The very small arc, coupled with ultra-thin sheet dimensions, have placed the entire operation well below the capabilities of unaided human vision.

A Good Report

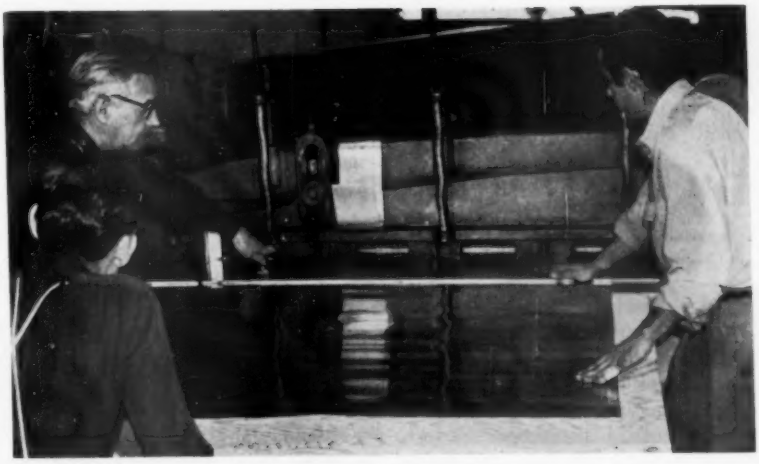
Welding speed is 48 to 50 in. per minute. No flux or filler wire is used. Current requirements at Airline follow a "1 to 1½ amp per 0.001 in. of thickness" rule.

The joint formed is a true square butt weld. Physical properties of the weld are all on the favorable side . . . failures in tension tests have occurred only in base metal; welded sheets will bend flat in the weld and the heat-affected zone, and ductility is excellent, ranging from 17 to 34% elongation in 2 in.

Failures are infrequent during welding, but when a burn-through occurs, no attempt is made to repair it. Instead, the entire sheet is resheared and rewelded.

After welding, stainless sheets are wiped with ordinary glass cleaner, and are then crated for shipment.

RIGHT: Stainless sheet 0.0005 in. thick is received in rolls 18 in. wide. Mill trim is not good enough for welding, so Airline shears up to ⅛ in. from edges (below). Sheet is clamped for shearing by aluminum hold-down bar which minimizes stresses that cause buckling.



LEFT: Tig welding begins as weldor peers through magnifying glass to strike diminutive arc that could not be watched closely without enlargement.

SIX standard projection welders and two-gun portable unit are used to assemble air-conditioner chassis on assembly-line basis at Borg-Warner's York (Pa.) Div. Welders join 12 different parts of various sizes, shapes and thicknesses. The latter range from 0.040 to 0.110 in.

"Conditioned" just right by projection welding

REAL COOL! That describes resistance welding techniques applied by York Div. of Borg-Warner to fabricate primary structures of air-conditioning units.

Six standard projection welders, plus a two-gun portable unit and a wrapper machine, are used to assemble the complex chassis on an assembly-line basis for ½-, ¾- and 1-ton air-conditioners. The welders were manufactured by Sciaky Bros., Inc. of Chicago.

These units join 12 different parts of various sizes, shapes and thicknesses to an 0.080-in. galvanized pan serving as the unit's base.

Technical Problems

Material thicknesses of parts range from 0.040 to 0.110 in. Four of them are mounted to the unit's side at a 90-deg angle to the others.

First consideration was given to a specially designed machine for chassis assembly. However, expense of production changeover, together with anticipated technical problems inherent in a highly complex machine, eliminated it as a practical method.

Analysis proved the most practical and economical method would be a multiple-assembly line with standard welder types. The six projection welders are adapted with simple fixturing. The portable machine joins a plenum condenser to the pan and a stabilizer to a scroll.

Assembly of air-conditioner chassis requires three unskilled operators. One loads and welds at the first three stations; another operates the next three stations; the third man works with the portable guns.

To weld parts of different thicknesses, ratings of main welding transformers vary from 50 to 250 kva. Throat depths measure from 5 to 18½ in., pneumatic head pressures range from 2,000 to 6,000 lb at 80-lb gage.

AT first station, 0.040-in. galvanized handle, used to pull pan from wrapper, is projection welded to 0.080-in. galvanized pan.

Intake Opening

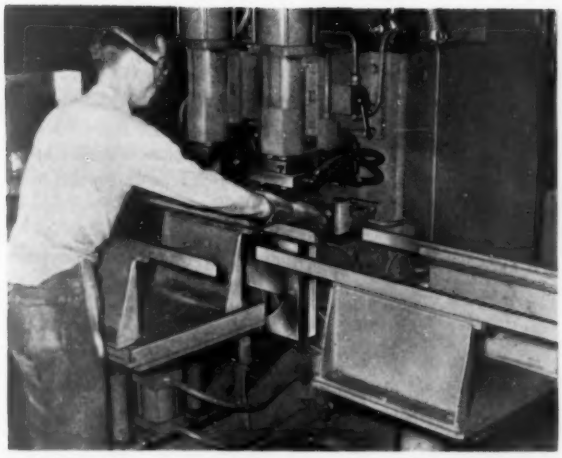
The machines at stations 1 through 6 are individually actuated by limit switches as the pan is pushed into welding position. Assembly is a right-to-left operation, and it begins when parts are fully loaded at stations 1, 2 and 3. A production rate of 90 units per hour is maintained on the chassis welding line.

At the first station, a 0.040-in. galvanized handle, used to pull the pan from the wrapper, is welded to two projections on the former by a 50-kva machine. The pan is then moved into the throat of the same machine, and a 2 1/16-in.-wide screen is welded to its intake opening.

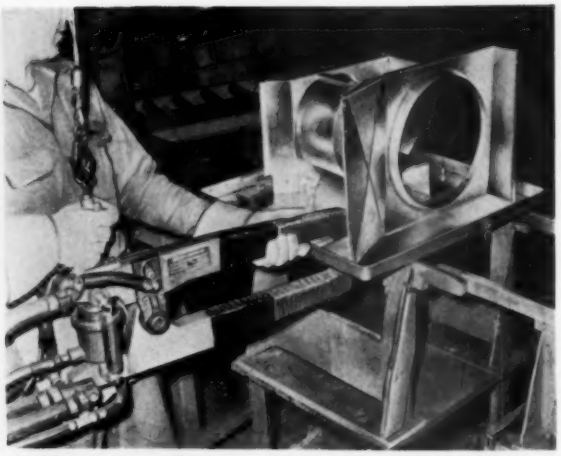
A 150-kva unit welds four 0.040-in. galvanized clips to eight projections on the pan in one operation at station 2. Two upper clips retain the cover; two inside clips support the evaporation drip pan.

At the third station, a 200-kva machine joins a motor-mounting bracket of 0.080-in. galvanized mild steel to the pan's undersurface. There are five projections in the bracket.

While the first three welding operations are in progress, the second operator loads parts into stations 4, 5 and 6. He then takes over the pan unit for further welding. The first operator immediately reloads stations



WHILE first three welding operations are in progress, second operator loads parts into stations 4, 5 and 6. He is shown here at sixth station.



FINAL welds are made with two-gun portable welder. Large gun is welding scroll stabilizer clip and two plenum condenser stabilizer clips to pan.

1, 2 and 3 to begin work on another unit.

Guide Rails

At the fourth station, a 250-kva machine welds two 0.110-in. compressor-mounting brackets to the pan. Eight projections are needed on the brackets.

The assembly moves on guide rails to station 5 where an 0.040-in. evaporator scroll partition is welded to it. Upon leaving the fifth station, the pan is moved onto a turntable and rotated 180 deg. It is then moved to station 6 where a 0.040-in. plenum condenser chamber is welded to it in one stroke.

Seven projections on the pan are needed to hold this part. Both fifth and sixth stations are equipped with 100-kva welders.

The pan assembly is again rotated 180 deg so that parts point upward. Final welds are made with the two-gun portable welder. The larger gun welds a 0.040-in. galvanized scroll stabilizer clip and two 0.040-in. plenum condenser stabilizer clips to the pan.

The smaller gun then welds each side of the plenum condenser to projections on both sides of the pan in two strokes.

Wrapper Assembly

To relieve monotony of operation and maintain production without fatigue, the three men involved in chassis assembly are qualified for all three assignments and can alternate.

Wrapper assembly involves use of still another projection welding machine. As with pan parts, the wrapper is galvanized. It is half the thickness of the pan.

First step in this separate operation involves loading (into holding fixtures) two 0.110-in. reinforcing angles, three 0.040-in. insulation clips and two 0.040-in. door clips. The wrapper is placed over these parts.

A hand switch indexes the fixture into welding position. An operator then pushes another button, starting welding sequence.

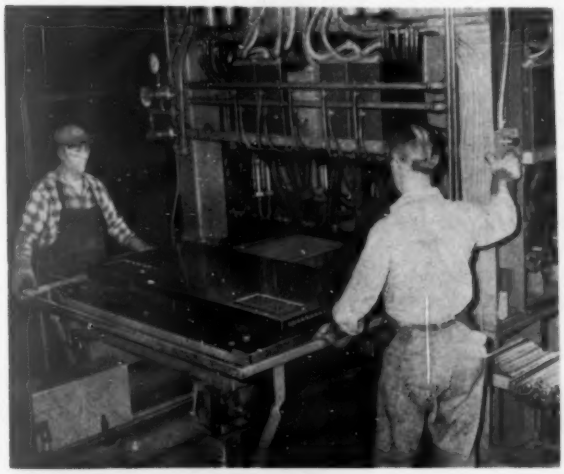
Using direct welding in four strokes, the machine makes 37 projection welds joining 7 parts. There are 10 projections each on support angles, a total of 13 on insulation-retaining clips, and 4 on door clips.

Near-Cubical Shape

Welds are made with vertical guns in three firings. At the end of off-time, vertical guns retract and horizontal guns start welding. One of the previous weld timers and ignitron contactors from the cascade firing circuit are used in this operation.

When the second sequence is completed, horizontal guns retract and the entire assembly indexes to its starting (and unloading) position. The wrapper is later creased twice to 90-deg angles to form three sides of the near-cubical air-conditioning unit.

York's technique for fabricating an air-conditioner chassis has permitted production increase without basic equipment change. In addition, the entire welder line is adaptable to seasonal model changeover, or to other welding operations. Maintenance problems have reportedly been reduced.



IN wrapper assembly, 37 welds join 7 galvanized parts to wrapper in four strokes of machine. Push-button control indexes fixture into welding position and initiates direct welding sequence.

TOWERING over rolling mill site are two water tanks, said to be only elevated ones of aluminum in the world. Photo at right shows Tig welding; Mig was also used. Filler wire was 5086 aluminum, same material as tank plates. Kaiser developed 5086.

Tig and Mig

Welded aluminum towers serve two purposes

By F. T. Tancula

TWO TOWERING, all-welded aluminum tanks built in Ravenswood, W. Va., for Kaiser Aluminum & Chemical Corp. are believed to be the only such elevated water-storage vessels in existence.

They also serve another purpose . . . as monumental outdoor advertisements for Kaiser's prime product. The West Virginia plant is a rolling mill which has just begun operation.

Tops of these welded structures rise 175 ft above the ground. Each tank has a capacity of 125,000 gal. They were fabricated and erected by Graver Tank & Mfg. Co., Inc., East Chicago, Ind. Except for cap and bottom plates, tanks were welded on the ground and raised above supporting leg members and standpipes.

High-Strength Aluminum

Basic material was high-strength 5086 aluminum (ASTM GM40A-B178), but standpipes and legs were mild steel—also welded. Each tank is bolted to these steel components. The 5086 aluminum is now an approved material for non-fired pressure vessels, although it was not at the time these tanks were erected.

Inert-gas processes joined all components in the field. Tig (tungsten inert-gas) was used on overhead joints in bottom sections, and in vertical seams in the straight shell section. Graver chose Tig for maximum soundness in these main stress-carrying joints, according to Amel Meyer, manager of welding research.

Circumferential welds in the

straight shell, just about all downhand welds, and all roof section joints were made with the Mig (metal inert-gas) process.

Bottom plates and plates in the bottom ring of the straight shell were 13/32 in. thick. The top ring and top sections have plates of 9/32-in. thickness.

Sub-Weldments Employed

Four sketch plates comprised a sub-assembly (for top and bottom sections) which was welded in a tent near the site. Four such sub-weldments made up the bottom section, and a similar number the top. All plate was hot-rolled in Graver's East Chicago plant.

The straight shell section is composed of two courses, each of which comprises four plates—bottom course plates are 13/32 in. thick, the top course 9/32 in.

The tank's four support members, which were bolted to the steel legs, were sub-assemblies that had two formed sections butt welded together. A formed plate section was then welded to this uppermost leg section (the only one of aluminum and actually an integral part of the tank wall —see photos), using a ¾-in. fillet in two passes.

By preparing this weldment as a sub-assembly, Meyer said Graver avoided the high shrinkage and stress concentration that would have been encountered had each formed plate been welded individually into the vertical tank.

Weld Procedure for Mig

Here is the welding procedure for Mig welds:

Only one pass on either side was used, except in circumferential welds of straight shell courses where two stringer beads were put down on either side.

The first seam was always back-chipped before welding the back-up bead.

Power source was a d-c constant-potential welder—in this case, a motor-generator set rated at 600 amp.

Welding wire was also 5086 aluminum, 1/16 in. in diameter.

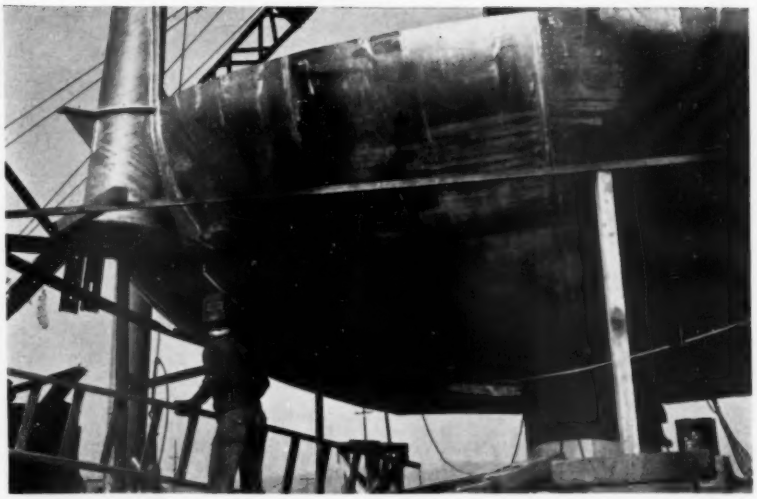
Shielding medium was pure argon, at a flow of 60 to 65 cfh.

Current settings were 240-260 amp, 26-27 arc volts.

On joints welded with the Tig method, one pass also was employed on either side. Power source for Tig welds was a-c, with amperage at 340-350, voltage at 30-36.

Filler wire was again 5086 aluminum rod, but 5/32 in. in diameter.

Shielding gas was argon, at 50 cfh.



BOTTOM section is composed of four sub-weldments of formed plates and four support members *(left in photo)* which are bolted to mild steel legs. Large leg in center is standpipe.

RIGHT: Completed tank, except for cap and bottom plates, is ready for elevation.

Edge Preparation

Edges on horizontal seams of the 13/32-in. material were prepared in the following manner: Upper plate was beveled 45 deg to a 3/16-in. nose; the lower plate had a straight edge. A 3/16-in. gap was left between plate edges.

Thinner plates (9/32-in.) were butt welded without any edge preparation, although they were gapped ⅛ in.

Vertical seams on 13/32-in. aluminum had a 3/16-in. nose on each edge and a 45-deg bevel *(90-deg included angle)* with ⅛-in. gap. On the narrower-gage plate, the gap was only 1/16 in. and edges were straight.

When sketch plates were welded to make a four-plate sub-assembly, they were butted tightly together, leaving no gap. When the sub-assemblies were positioned for welding, however, a ⅛-in. gap was employed.

On this 13/32-in. aluminum plate, edges were prepared in the same manner as above—45-deg bevel, 3/16-in. nose.

CLOSE to destination, tank is raised through temporary horizontal support struts. After tank reaches top, these struts are replaced with straight members. Spread-eagled legs were brought back under tank for bolting.

Resistance Welding

Spots & projections:

Resistance uses are limited only by imagination

By Jack Fairlie

RESTRICTIVE patents which might have slowed the new-born resistance welding industry to a snail's pace were swept aside by the ruling of the U. S. Supreme Court in 1924.

In a decision that must always be remembered as a milestone by this modern and growth-conscious industry, the court held a patent issued in 1885 to Elihu Thompson had disclosed all forms of resistance welding.

In short, the Nine Men permitted free development of Thompson's theories—and refinements of his early spot welder.

Principal Developments

And development there was . . . of seam, projection and flash welding processes . . . and of other resistance welding methods that constituted variations of the four principal types. *(For a brief description of this development, read* "The past and present," *Jan., p. 20.)*

Just how valid the Supreme Court patent evaluation was is plainly evidenced in the operating principles of all modern resistance welding units. Each process is dependent on many similar elements, some of which are actually common to all the processess.

In every resistance welding machine, for example, there is a transformer with primary and secondary circuits, a current regulator, magnetic contactor and a timer; there are electrodes, and there is a device—pneumatic, hydraulic or mechanical—to create clamping pressure.

The primary circuit of the welding transformer receives current from the electric power supply. A magnetic contactor between power inlet and the primary, however, will open and close in response to a preset timing device to control amount of incoming voltage.

On the primary winding, which is joined to the heat regulator, are taps which permit voltage connection to various parts of the winding. By varying the number of taps, amount of current flowing to the secondary winding is also regulated.

—Courtesy General Electric Co.

TWO of four principal types of resistance welding processes are the spot and projection methods. Projection welding electrodes can be larger than those used for spot welding because projection on workpiece localizes high currents and clamping pressure.

Since the transformer is installed in the resistance welding machine to reduce power supply voltage to required welding current, the number of turns in the primary circuit windings can be adjusted to obtain proper secondary voltage (welding current).

To measure welding current in the machine, determine primary current and multiply it by the transformer turns ratio. Affecting this ratio, as previously noted, will be the number of taps used to step-down current.

Current reaching secondary windings flows in an open circuit through the horns to electrodes. And in this welding area, it is impeded: by specific resistance of metal being welded; by resistance between electrodes and metal, and by resistance encountered between the lapped plates.

Heat Confinement

The latter two resistance factors are not constant; they will vary with welding pressure, with the electrode's shape, size, material and surface condition, and with surface condition of the material being welded.

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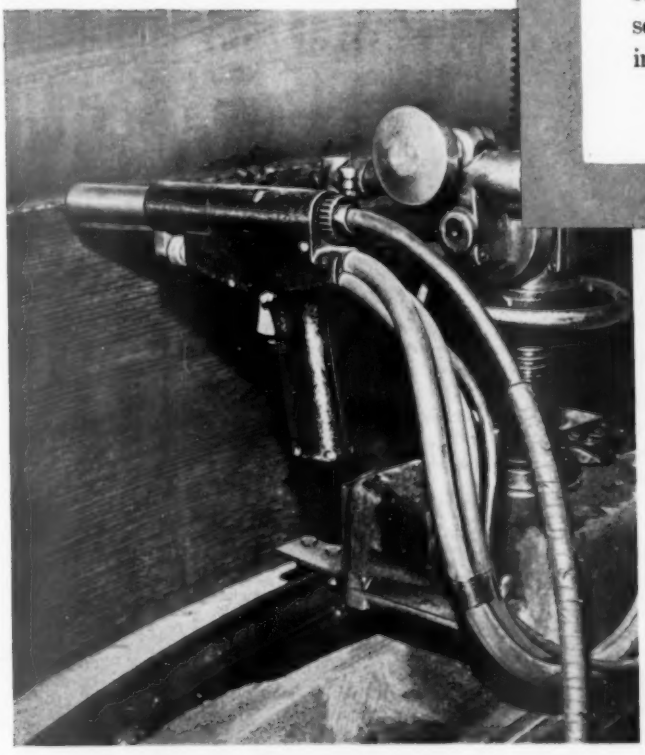

This is the interior wall of a kraft digester used in a leading pulp mill. A stainless weld overlay is applied automatically by the inert gas consumable electrode process. 6,000 pounds of Crucible Rezistal stainless, overlay welding wire 1/16" was used to cover 1,400 square feet of area. The cost: one-third that of vessel replacement.

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It is the combination of all resistance factors, in varying degrees of magnitude, that creates sufficient heat for welding. When a spot, projection or seam welder is used, welding heat is confined to an area immediately between the electrodes. (Flash welding heat is actually generated by intense arcing between the metals to be joined.)

Why is welding heat reached only between electrodes, and not in a larger area? The answer is found in the electrodes—copper or copper-alloy—which are always more highly conductive than material being welded.

When steel is being welded, it conducts heat at a rate as low as 1/10 that of the copper electrodes. Heat generated by the three resistance factors, therefore, will not radiate through the workpiece as quickly as it will radiate back toward (and through) the electrodes.

As a result of this inter-electrode heat pattern, temperatures high enough for fusion are reached very quickly in the small area between electrodes.

(The word *fusion* is used here in its descriptive sense; actually, resistance welding processes are *not* fusion welding processes. The element of pressure, common to every resistance weld, removes them from the category of true fusion welding processes.)

Process Differentiation

Probably the most popular of all resistance processes is spot welding. It was the first to be developed, and it is still the most widely used.

The brief description of resistance welding machine components given above would provide a fairly accurate parts list for a simple spot welder. Its transformer might be a single-phase type, and the secondary winding would provide high current at low potential to the copper electrodes.

A pair of horns (arms) would conduct current to the electrodes, and the device providing clamping pressure might be any of the three previously described. It could also be operated by a motor, and welding pressure would be synchronized to the welding cycle by means of a rotating cam control.

Beyond the point of simple concurrence with fundamental design aspects, however, the spot welding machine may be one of several types or classes.

Two Major Classes

Generally, there are single and multiple spot welding units. Characterizing the single spot weld is the transmission of welding current through only one electrode in the course of any one period of current flow.

A single-spot welder may perform its job in a direct or indirect manner by employing, respectively, either two current-carrying electrodes, or one positive and one negative electrode.

There are stationary (or *pedestal*) and portable (or *gun*) welders in the single-spot class. The stationary units will operate with a rocker arm or as a direct press type.

A rocker arm spot welder, which is generally designed to handle lighter-gage material, has a stationary arm (the lower) and one that moves to permit workpiece placement. The direct press type differs from this machine in that its arms are stationary, and only the upper electrode moves vertically to clamp and weld the work.

Portable spot welding units were designed to overcome problems in applications where workpieces were too large or too complex to be fitted onto stationary welding machines. Pinch, expansion and bar (or lever) guns comprise the portable welder category. Most versatile of the group are the pinch welding guns, because no fixture need be used with them.

Multiple Welds

Any unit completing two or more welds in a single operation falls into the multiple spot welder class. Usually automatic, and invariably custom-built for a particular application, the multi-electrode spot welder operates on welding current commutated successively between the electrodes.

Usually operated hydraulically, most multiple welding machines have electrodes mounted directly beneath cylinder assemblies. Travel valves (rotary or linear types) activate welding sequence, and a cam attached to the valves controls timing by tripping switches or electronic control devices.

(A future article in this series will discuss, in detail, equipment and controls for spot welding, plus weld-quality and weld-testing factors in this resistance process.)

Similar in many respects to spot welding is the projection welding process. So alike are these resistance

MEMBER FIRMS

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Taylor-Winfield Corp. 1052 Mahoning Ave., NW Warren, Ohio	Thomson Electric Welder Co. 161 Pleasant St. Lynn, Mass.
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methods that a spot welding unit is often employed to make projection welds. The reverse is also true where projection welding electrodes are similar in design to spot electrodes.

Projection Welding

This resistance process derives its name from the fact that parts to be welded must have a projection of regular design embossed on them. Circular projections are most common, and practice has shown them to be highly suitable for welding flat pieces. Square, oval or oblong projections, however, are not unusual.

Power sources, transformers and welding controls for projection units are identical to those for spot welders in most cases. But electrodes used in the former process often provide some measure of differentiation.

Projection welding electrodes are usually larger in diameter than their spot welding counterparts, and they are frequently made with a harder copper alloy. As a result, they have a longer service life.

Since clamping pressure and welding current are localized by the projection in the workpiece, large-diameter electrodes often enable the fabricator to complete two or more welds in one operation. In fact, the electrodes need not be circular—they could be (and often are) rectangular in shape, and capable of making several welds at once.

Embossed in Stamping

Stamped parts, as well as those that are formed or punched, make ideal subjects for projection welding applications, since the projection may be embossed on the part during its forming. Other popular applications for this versatile process include cross-wire welding (which has developed into a specialized process), the welding of screw machine parts, and tube-to-plate welds.

The welding projection, on parts of dissimilar thicknesses, should always be on the thicker part. Dimensions of the projection, however, are always based on thickness of the thinner part.

Basically, a good projection should be easy to form, and it should also possess sufficient strength to withstand the pressure application before welding current is turned on. A projection must be able to raise a spot in the flat surface opposing it. Projections that are too thin or badly formed will collapse under heat and/or pressure before doing so.

A smooth contour is another trademark of the good projection; partial shearing to form the sides will only result in an inherently weak projection.

Near-Perfect Contact

When a projection collapses as the weld is made, it must do so without spreading over a larger area. It must also remain in near-perfect contact with its mating part, and it should not create more than minute distortion of the part on which it is formed.

To obtain the maximum in strength and rigidity, manufacturers usually produce press-type projection welding machines. Clamping pressure for this process is extremely heavy, and strong reinforcement is necessary for secondary arms and supporting members. By using press-type machines, the user is also assured of better welds in fixtures that will not deflect under pressure.

A projection welding head must possess low inertia movement so that pressure can be applied steadily during welding.

—Courtesy Sciaky Bros., Inc.

OPERATOR of press-type projection welder places part to be welded on fixture. Electrode is rectangular and capable of making two or more welds at one time. Platen is heavily reinforced to withstand clamping pressure.

—Courtesy General Electric Co.

STONE guard is spot welded to an auto shock absorber. Lower electrode is eliminated in this operation and shock absorber is slipped over lower horn on welding machine.

(In the April issue of WELDING ENGINEER, *seam and flash welding processes will be described. Following that article, at closely-spaced intervals, will be others describing all the pertinent details of resistance welding equipment and controls, machine maintenance, quality control, and many other factors.)*

Worthington positioner built for Combustion Engineering, Inc., Chattanooga, Tenn., handles loads up to 100,000 lbs.

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WORTHINGTON

LOOK FOR OUR DISPLAY IN BOOTH #207, WELDING SHOW, PHILADELPHIA, APRIL 9-11

Anyone who has spent just 30 seconds on a windy street corner is unquestionably familiar with some of the more exotic applications for nylon. For less arresting, but more utilitarian reasons, nylon has also brightened the lives of rod-and-reel sportsmen. Rot- and mildew-proof fishing line has higher toughness and tensile strength than any other fiber used for this purpose, but brazed reels were needed to help it attain maximum usefulness.

—*Courtesy Handy & Harman*

ASSEMBLED spool is placed in brazing fixture. Machine consists of pair of opposed drill press heads countershafted to assure synchronous rotation.

Brazing lengthens reel life

FOR THE designer, nylon raises problems . . . and solves them. Its exceptional elasticity (some nylon undergoes 20-25% elongation) creates tremendous compressive forces when wound onto a spool even at moderate tension.

In big-game fishing reels this problem is very serious because, in attempting to land a battling heavyweight fish (record tuna is 977 lb), the line is reeled in under high tension.

Soon after the advent of nylon fishing line, Montague-Ocean City Rod & Reel Co., Philadelphia, Pa., recognized that spool design would have to be changed to withstand compressive flange-spreading forces of tightly-wound elastic line.

Elongated Holes

Spools originally were assembled from two finished halves, with the bored hub of each half fitted over a solid steel spindle. Each spool half was secured with two 3/16-in. stainless steel dowels pressfitted through the diameter of hub and spindle.

In some cases, compressive forces were large enough to spread flanges of the spool so that it bound against the reel housing. In extreme cases, dowels were sheared off and holes in the hubs badly elongated.

To strengthen the spool, Ocean City redesigned the assembly to silver braze two half-spools directly to the spindle and eliminate dowels.

Flange Diameter

Shear strength of a good brazed joint exceeds 40,000 psi. Compared with an assembly held together by two double shear-loaded steel pins, greater surface area of the brazed joint is much more effective in preventing the hub from creeping toward spindle ends when under compression.

Spool halves are brass forgings stress relieved at 800-900 F. This prevents possible warpage during final machining to finished shape and thickness. Because of tight clearance between spool and reel, machining tolerances are held very closely.

Flange diameter is held to ± 0.002 in.; flange face is held true within ± 0.0015 in. of center bore line and flange width within ± 0.0025 in. Final machining is done after the spool is brazed.

Machining before brazing consists of finishing the outer surface of spool flanges; boring ID of the hub to size; facing-off butting edges of hubs, and countersinking a shallow socket in each joint face to accommodate a preplaced ring of BAg-1 silver brazing alloy.

The first assembly step is pressing a spindle into one of the spools with an arbor press. The spindle has a 1/16-in.-diameter ring of brazing alloy encircling it.

Before insertion, the spindle, alloy ring and spool bore are coated with flux. A stop in the base of the centering fixture controls insertion depth.

Mechanical Assembly

To compensate for the appreciable difference in thermal expansion coefficients of brass and steel, a forced

fit between hub and spindle is necessary at room temperature to obtain clearance of about 0.003 in. at brazing temperature.

In silver brazing, maximum joint strength is obtained when joint thicknesses lie between 0.001 and 0.005. The mechanical assembly is completed when the second-half spool is pressed onto the spindle, with the brazing alloy ring sandwiched between mating edges of abutting hubs.

Assembled spools are brazed on a machine next to the assembly station. The brazing machine, devised by Ocean City production engineers, was designed to meet specialized heating requirements with standard plant equipment.

It was constructed from two old drill pressheads mounted on a common support post with lower head inverted. A pair of flywheels, mounted on the spindle of each press head, serve as two halves of the brazing fixture.

Drive gears of the two press heads are countershafted together to synchronize rotation and prevent torsion between the two spool halves during the brazing cycle. Drive shaft is powered by a V-belt drive operating at 18 rpm.

Pair of Burners

The spool assembly is positioned in the fixture with spindle ends inserted in sockets to assure alignment. Sockets are lined with an asbestos cement bushing to keep spindle ends from sticking to the fixture because of excess flux or alloy spatter.

Ocean City constructed the burner assembly from readily available plant materials. It consists of a pair of opposed, multi-port, Monel-tipped burners (the type used for tipping-off radio tubes) mounted at ends of a Y-shaped fuel line made of ⅜-in. pipe.

FLUXED spindle and silver alloy ring are inserted into lower half of spool. Assembly is completed when spool's upper half is pressed onto spindle.

The fuel supply, city gas and oxygen, is proportioned manually by needle valves on feeder lines and passed through a mixing valve before entering the Y. The yoke is mounted on a vertical post by a screw clamp arrangement which provides a quick and simple means of adjusting height and horizontal reach of burners to suit ten spool sizes.

The vertical support post is mounted in a base which slides back and forth along a track to enable the operator to advance and retract burners at the beginning and end of a heating cycle.

To start a brazing cycle, the operator slides burners into heating position and starts the timer which operates solenoid valves. These valves, in turn, start fuel flow and the fixture's drive motor.

Low Melting Point

Duration of heating cycle and machine rotation are timed to permit heat conduction through the brass hub into the spindle. This assures complete melting and uniform distribution of filler metal along the spindle and ID of the hub.

Weight of upper flywheel and drill press spindle assembly close the joint between the two halves when silver solder melts.

Low melting point of the silver brazing alloy permits the operator to keep heat at safe levels to prevent annealing of brass flanges. Melting point is 1,125 F; flow point is 1,145 F.

Another advantage is that alloy flow occurs by capillary action, and is largely independent of gravity. Therefore, molten alloy flows upward as well as downward and thoroughly wets the vertically-oriented spindle.

At the end of a heating period (about 40 seconds for the smallest spool), the timer-operated solenoid shuts off oxygen supply and 95% of gas flow, leaving only a pilot flame.

Cooling System

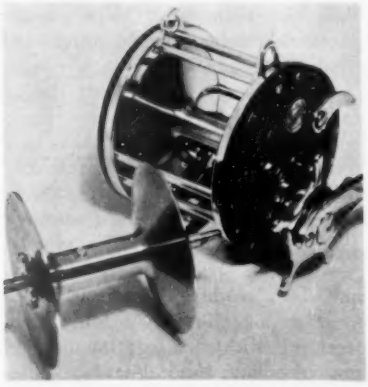
The fixture continues to rotate (to air-cool the assembly) until the operator is ready to remove it. The spool is not quenched to prevent changing temper of the brass. Production rate is 20 to 30 spools an hour.

A simple, but effective, cooling system was devised to keep fixture platens cool during prolonged periods of operation, and to draw off some heat from flanges.

Edges of flywheels are flanged to a depth of about ¼ in., forming a natural pool which the operator keeps filled with water. Heat that would ordinarily be absorbed by the fixture is dissipated by evaporation of water.

After a rinse to remove flux and descaling, spools are sent to be finish machined. Inside faces of spool and hub are turned down to final diameter and plated.

Ocean City's redesign for brazing not only strengthened spools, but also reduced machining time formerly needed to drill, align and assemble the spool with dowel pins.



REEL assembly shows spool in position. Small pin on spool provides anchorage for line.

SPEAKERS at 1957 Midwest Welding Conference were J. E. Dato, George Linnert and R. C. Singleton *(seated, l. to r.)*. Standing are conference chairman Harry Schwartzbart of ARF, and presiding chairman Glen O. Fruit of Iowa-Illinois AWS section.

From studs to safety:

The Midwest meeting views modern welding

By a Staff Member

SUCCESS of two earlier Midwest Welding Conferences in Chicago left some participants with visions of a bigger and better 1957 meeting.

The 1955 and '56 conferences, sponsored by Armour Research Foundation of Illinois Institute of Technology and Chicago's AWS section, met in an auditorium on IIT's south-side campus.

A closer interim look at the essential purpose of the Midwest Welding Conference, however, led planners to again select an IIT site.

Attendance Dropped

Attendance in 1956 was estimated at approximately 300; this number was purposely cut to slightly over 200 for the 1957 conference (January 30-31). This decision was reached at a meeting of AWS District 7 (Central zone), where it was felt that the MWC should be selective and educational . . . not general and social in nature.

Among 12 scheduled speakers on the two-day program were George Linnert of Armco Steel Corp. and R. C. Singleton of Nelson Stud Welding. Mr. Linnert, 1956 Adams Lecturer at the AWS national fall meeting, spoke on "Trouble-free service from stainless steel weldments." Mr. Singleton's paper was titled, "Research and application of stud welding."

Other speakers included J. E. Dato, Linde Air Products Co. ("Role of inert-gas welding in industry"); P. Patriarca, Oak Ridge National Laboratory ("High-temperature brazing"); F. V. Daly, Newport News Shipbuilding & Drydock Co. ("Welded fabrication of a homogeneous reactor core and pressure vessel"), and N. Block, Foster Wheeler Corp. ("Welding of equipment for nuclear plants").

Tuesday's program presented speakers J. D. Robinson, Bendix Aviation Corp. ("Application of welding for salvage of machine parts"); E. E. Williams, Factory Insurance Ass'n. ("Fire safety for welding and cutting operations"); A. P. Lage, Menasco Mfg. Co. ("Pressure welding"), and J. R. Stitt, R. C. Mahon Co. ("Distortion in welding—causes, prevention and cure").

W. C. Rudd, New Rochelle Tool Corp., spoke on "High-frequency resistance welding," and O. H. Kuhlke, General American Transportation Corp., chose as his topic, "Fabrication by welding of aluminum structures."

Under conference chairman Harry Schwartzbart, head of ARF's welding section, this well-planned program maintained a tight schedule. Practically all of those registered for the conference attended every talk, and the question-and-answer periods which invariably followed.

Welding Stands Up

Here are a few highlights of the two-day program:

Linnert—"Approximately 750,000 tons of stainless steel are fabricated annually; much of it is welded, yet only a fraction of total weldments fail. Chief causes of failure: the notch effect in unfused butt joints . . . stress-corrosion cracking . . . contamination."

Rudd—"High-frequency resistance welding has advantages over conventional methods: higher speeds . . . smaller heat-affected zone . . . decreased need for extra-careful weld-edge preparation . . . versatility."

Williams—"Use of the *welding permit* throughout a plant is one system whereby fires may be eliminated or their size reduced. It helps educate personnel using flame-cutting and welding equipment."

Stitt—"Beams badly bent during fabrication or service can be straightened by the application of heat in a proper pattern" (*a method described fully in four articles appearing in the March, April, October and December, 1955, issues of* WELDING ENGINEER).

While no specific plans for 1958 have been made, a concensus at the most recent Midwest Welding Conference indicates a continuation of present policy: the intimate presentation of valuable welding information to a small group of key personnel from varied industries.

IN THE SHOP

The quick test can be made with Magnaflux, as soon as welds are completed . . . right in the shop, for quick low-cost repair. (Test of welded earthmover bucket arm).

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By and large, today's welding practices, design factors, and test methods are pointed toward further extending the use of welding as a fabrication method. As a result realistic standards are being established — not severe — which meet measured service requirements to provide consistent satisfactory quality.

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When they are *sure* of good welding, engineers can often design functionally better parts that cost less. Needless weight can be safely trimmed. And, in both production and maintenance, Magnaflux reduces scrap by assuring the dependability of salvage welding.

Magnaflux testing is fast and low-cost. It can be used with any method of welding—at full production rates, if that's your need.

Ask to have a Magnaflux Field Engineer explore with you how Magnaflux Testing Systems can improve the quantity and quality of your welding — and save you money, too!

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NEWSFRONTS

▲ The immense power and strength of Pioneer crushers are evidenced by the fact that the unit shown here takes rock up to 40" x 46" and reduces them to sizes as small as 7". And it does so at the rate of 700 tons per hour!

Both internal and external welds must have tremendous impact resistance. In fact the entire unit must be as trouble-free as practicably possible because most crusher installations are made at considerable distance from any service and repair facilities. ▶

Giant 4248 crusher built to thrive on a diet of 4ft. boulders!

Imagine the terrific strains the welds take when this crusher smashes a four-foot boulder into baseball-sized rocks. That's why Pioneer Engineering Works builds it with A. O. Smith electrodes for the critical welds.

Here's another example of how leading manufacturers safeguard the performance and life of their products by welding with A. O. Smith electrodes.

Pioneer Engineering—Division of Poor & Company (Inc.,) Minneapolis, Minn., builds a line of process equipment that must stand up under rugged service. Thus, crusher bases, which take a constant beating, are welded with A. O. Smith electrodes. Rods include SW-35 (AWS E-6020) for deep penetration . . . and SW-15 (AWS E-6013)—America's most famous all-position high-production electrode.

If, like Pioneer, you use welding in your business, you'll find it pays to insist on A. O. Smith welding electrodes. You'll find their consistent high quality and uniformity help you get the job done faster, better and at lower overall cost. Why not get the complete story from your man from A. O. Smith.

The man from A. O. Smith

John Rehm is the A. O. Smith weld-consultant who works with Pioneer. More than a salesman, he's a welding specialist ready and eager to help with any welding problem you may have.

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CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

International Division: Milwaukee 1, Wisconsin

March 25-29:

It's Los Angeles again for the Metals Congress

AWS technical program is planned by members of Los Angeles section: (left to right) C. B. Smith *(Douglas Aircraft)*, section chairman; C. W. Concannon *(Absco, Inc.)*, program committee chairman; J. R. Rose *(American Platinum Works)*, section secretary-treasurer, and D. P. O'Connor *(L. A. Water and Power Dept.)* section vice chairman.

By Robert Kular

AIRCRAFT, guided-missile, petroleum and electronics industries will be given special attention at the 10th Western Metals Congress and Exposition, to be held March 25-29 in Los Angeles.

Presented by the American Society for Metals, in cooperation with the western sections of 36 other national technical societies, the congress will headquarter in the Ambassador Hotel. The exposition will occupy Pan-Pacific Auditorium and four pavilions.

The American Welding Society is one of four societies which have scheduled technical sessions of their own as congress program features. T. B. Jefferson, editor and publisher of WELDING ENGINEER, is scheduled to speak on "Welding codes—stimulant or stumbling block?" at the initial AWS session.

Kick-Off Luncheon

Other groups presenting individual technical sessions are the American Society for Metals, Society for Non-Destructive Testing, and American Institute of Mining, Metallurgical and Petroleum Engineers (Metals Div. and Industrial Heating Equipment Assn.).

These participating groups have designed technical sessions to serve expanded Western metal industries. Papers will be delivered on selection, fabrication, application, and testing of metals for war production and industrial purposes. Production and engineering will be stressed.

The AWS congress sessions will get under way after a kick-off luncheon honoring national officers on March 25 at the Ambassador Hotel. J. J. Chyle, AWS president and director of welding research at A. O. Smith Corp., Milwaukee, Wis., will speak on "The role of welding in industrial advancement" at the luncheon.

Three simultaneous sessions have been scheduled by the Los Angeles section of AWS for the following times: Tuesday morning and afternoon, March 26; Wednesday afternoon, March 27; Thursday afternoon, March 28, and Friday morning, March 29.

Four simultaneous sessions will be held Wednesday morning, March 27, and Thursday morning, March 28. Only one session is planned for Monday afternoon, March 25, at which time Mr. Jefferson will discuss welding codes.

AWS Highlights

Aircraft and rocketry will be emphasized in papers presented at earlier AWS technical meetings. Widely divergent welding processes and techniques will be discussed during later sessions.

Some highlights will include papers on "Recent developments in magnetic force welding," by Jack Funk, Precision Welder & Flexopress Corp.; "Vacuum brazing of sandwich structures," by G. J. Crites, indepent engineering consultant, and "A new CO_2 welding process," by A. F. Chouinard and R. T. Monroe, National Cylinder Gas Co.

To be presented also are papers on welding for nuclear pumping applications; stress corrosion of titanium weldments; high-temperature atmosphere silver-brazing, and use of iron powder in electrodes.

The American Society for Metals has planned eight technical sessions in the Ambassador Hotel—all in the form of panel discussions. Outstanding panelists will be prepared to conduct question and answer forums.

Speakers will deliver papers on fabrication, machining and testing of metals. There will also be talks on new developments in the rocket, electronics and chemical industries. One entire session will be devoted to industrial heating.

Missile Industry

The ASM panels are also expected to pay particular attention to inhibition of corrosion in the petroleum and chemical industries.

The Society for Non-Destructive Testing's program will be based on non-destructive testing for aircraft industries; testing with isotopes, radiography and fluorescent penetrants; testing in the nuclear energy field, and non-destructive gaging and quality control.

This group's first few meetings will

be educational in theme.

The American Institute of Mining, Metallurgical and Petroleum Engineers has programmed three sessions of particular interest to the aircraft and missile industries.

The trio of meetings will be respectively dedicated to alloys for future airframes, ultra-high-temperature materials, and light alloys for airframes.

A major highlight of the 10th Western Metal Congress will be a titanium conference sponsored by the ASM's Metals Engineering Institute. It will run simultaneously with the congress' other technical sessions.

Exposition Space

The entire titanium field is expected to be surveyed in a wide variety of lectures and discussions. Topics will include development of new titanium alloys; contamination by oxygen, nitrogen and hydrogen; shop fabrication problems, and welding, grinding and machining of titanium.

Registration for the titanium conference is limited to approximately 100, and a fee will be charged.

Occupying Los Angeles' Pan-Pacific Auditorium and four large pavilions, the Metal Exposition will take up more space than on any previous occasion. Two years ago, the display became the largest exhibit of its kind ever held in the west by filling the same auditorium and only two pavilions.

Attendance at the ninth presentation of the colorful exposition in 1955 has been estimated at 53,639. This year's attendance is expected to exceed that figure considerably.

Two years ago, the number of exhibits totaled 300. This year the total is expected to stand at approximately 400.

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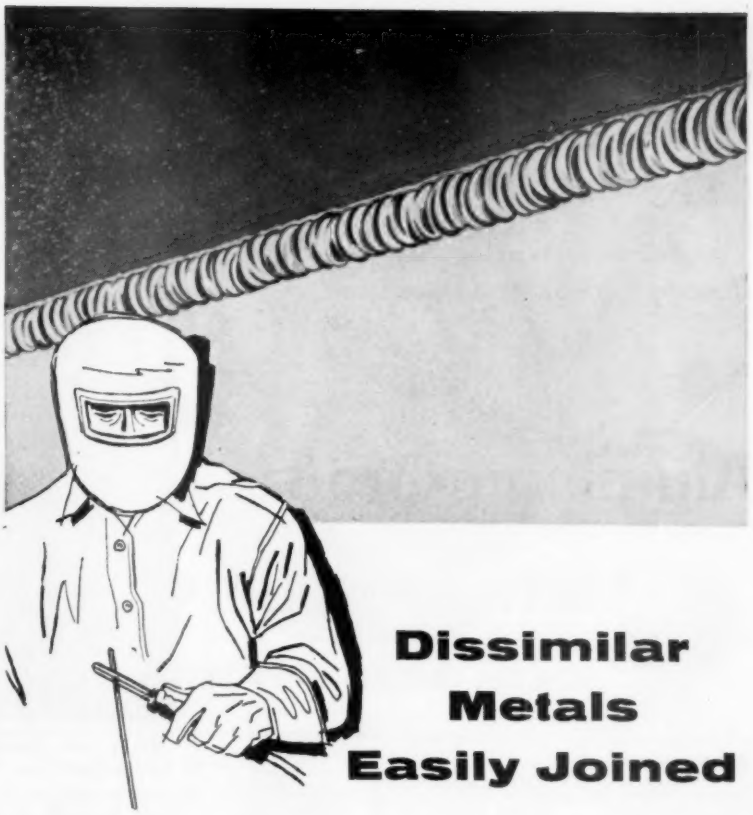

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For an increasing number of surfacing applications, it's...

Aluminum-bronze to the rescue

MILD steel dished heads are being formed using male and female dies fabricated from SAE1030 steel. Aluminum-bronze is deposited on steel by metal-arc process with ECuAl-E coated electrodes.

By Wayne E. Claflin
Ampco Metal, Inc.
Milwaukee, Wis.

ALUMINUM-BRONZE alloys are being used in a host of surfacing applications.

Because hardness can be controlled from 140 to 380 Brinell (3,000-kg load) by using different grades and various welding processes, aluminum-bronze overlays have become the answer to many design engineers' problems.

TIG process was used with RCuAl-D filler rod in fabrication of draw ring from SAE6140 steel.

They are also popular because their ultimate tensile strength, ductility and comprehensive strength values can be varied to meet specific demands.

The most generally used aluminum-bronze alloy in the die field (12-13% Al, 3-5% F) is in the coated electrode, ECuAl-E (AWS-ASTM classification), and in the bare filler rod, RCuAl-D. These electrodes and rods are used extensively throughout industry for fabrication of composite drawing and forming die rings and punches.

Frictional Loading

Hardness is not the only criterion of die wear. Other properties are also important in die life and, particularly, in performance. Low coefficient of friction, plus ability to resist deformation under heavy pressures, and yield strength in compression are perhaps the most important factors to consider.

Die material should have structural qualities conducive to mating to eliminate (or greatly reduce) seizing, scratching, galling and wrinkling when subjected to heavy frictional loading against various types of steels.

Dissimilar metals will always produce less resistance to sliding or drag than like metals. Therefore, harder aluminum-bronze alloys joined to ferrous metals and their alloys produces a combination resulting in good sliding conditions.

Aluminum-bronze deposited on steel by the metal-arc process will develop a die surface having excellent anti-frictional characteristics. The result is reduction or elimination of scratching and galling.

This type of composite die will also have exceptionally high resistance to *squashing out* since compressive strength is around 175,000 psi.

Limewater Lubricant

Therefore, an aluminum bronze overlaid die can stand extremely high working pressures exerted by huge presses in drawing and forming operations. In almost all cases, the pressure pad or hold-down ring should also be surfaced with aluminum-bronze.

Die design requirements for composite dies are not stringent. How-

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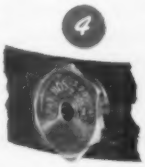
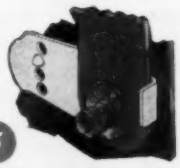


Revolutionary, light, durable material with entire mechanism enclosed in fibre tube insulating it from head of wearer. Right or left turning to adjust size . . . remains positive.

4-POSITION ADJUSTABLE HELMET STOP 5



Positions helmet for overhead and vertical welding. Positive stop, easily adjustable to any of 4 positions without tools. Allows normal raising of helmet on friction joints.

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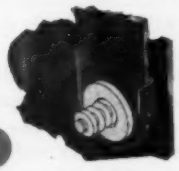

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ever, due to higher thermal expansion, clearances should be somewhat greater than for ferrous dies. Since this type of alloy has a tendency to work-harden slightly in service, some care should be exercised in starting or breaking-in such dies.

It has been found that some of the most successful shops use a fairly thick limewater as a lubricant for the break-in period. A solution possessing the consistency of medium coffee cream is recommended.

With regard to actual welding of aluminum-bronze composite dies, it has been found that the manual arc welding process is generally used with ECuA1-E electrodes. In instances where die shops or departments are using the Tig (tungsten inert-gas) process, RCuA1-D filler rods are used.

Usually 1020 or 1040 hot-rolled steel is selected for overlay; in some cases, however, an annealed tool steel base may be used. Motor-generator or selenium rectifier machines, on reverse polarity, are used to deposit electrode weld metal.

Initial preheat is not too important for the first layer on steel. Generally, a 300-F preheat is recommended. On subsequent layers, it is important to maintain a constant interpass temperature of approximately 600 F.

Additional Layers

First layer of weld metal should be deposited with as wide a weaving motion as can be conveniently maintained. Purpose of this method is to keep base metal pick-up at a minimum. Welding amperage setting should be in the medium range of the manufacturer's recommended amperage for the first layer.

WORN tool steel punch for forming sealed-in refrigerator units is built up by metal-arc process using ECuAl-E coated electrodes.

On die rings it is advantageous to skip-weld at various degrees around the circumference rather than to weld continuously. This tends to eliminate stresses and avoids possibility of cracking.

For additional layers, it is best to use as large a diameter electrode as possible. Again, a wide weaving motion is used. Best results are usually obtained by using 3/16 or ¼-in. electrodes.

When the first layer has been deposited, a higher amperage may be used to good advantage. After base metal has been covered with aluminum-bronze, there is no further danger of additional base metal pick-up.

Therefore, larger-diameter electrodes and higher amperages are recommended to increase rate of deposition and lower welding costs. Although wide weaving beads are used for surface build-up, it is good practice to build up shoulders or edges with string beads.

Steel Cushion Layer

When depositing bare aluminum-bronze rods with the Tig process, thoriated tungsten electrodes are used with d-c straight polarity. Helium should be the shielding gas in this instance. When a-c high-frequency equipment is used, argon should be employed as the shielding gas.

In many industries (particularly in automotive plants), large body dies are made of various forms of cast iron. Although it is not highly recommended, aluminum-bronzes have been used successfully to repair this type of die.

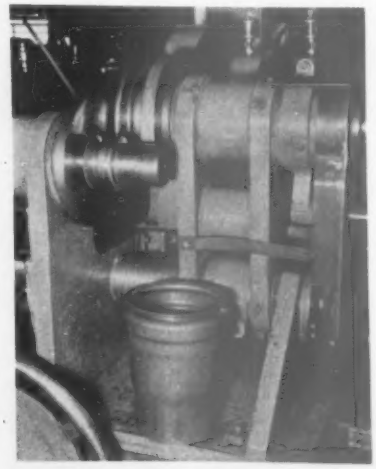
Cast iron dies should be degreased thoroughly and undercut approximately ¼ in. from finish contour. On heavy sections, steel studding has often proved advantageous.

A local preheat of 300 F should be made before welding. To avoid excessive cracking, it may be advisable to deposit a cushion layer of stainless steel or a layer of the softer aluminum-bronze, ECuA1-A2. Finishing on dies of this type is usually done by grinding.

Experience has demonstrated that cast iron dies properly repaired with aluminum-bronze overlays on various severe radii have given exceptionally long life.

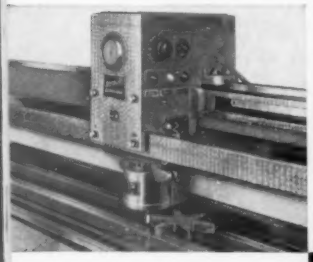
Due to elimination of scratching and galling of the drawn part, downtime for dressing and polishing has been cut to a minimum. Resultant work, which is of higher quality, likewise requires less polishing.

There are many advantages in using composite dies overlaid with aluminum-bronze: *(1)* the dense, homogeneous weld deposit will machine to a fine micro-finish; *(2)* the speed of getting a fabricated die into operation is highly important to a manufacturing program, and *(3)* low cost and low inventory will appeal to many die room superintendents.

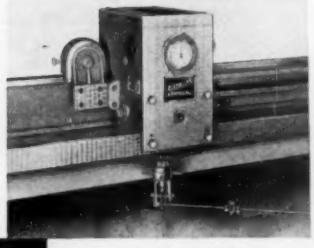


IRRIGATION couplers and sprinkler outlets are produced using ECuAl-E overlaid rolls.

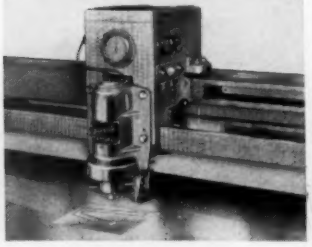
Magnetic Head



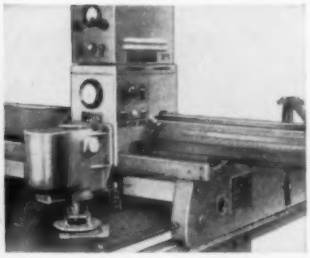
Automatic Circle Cutting Attachment

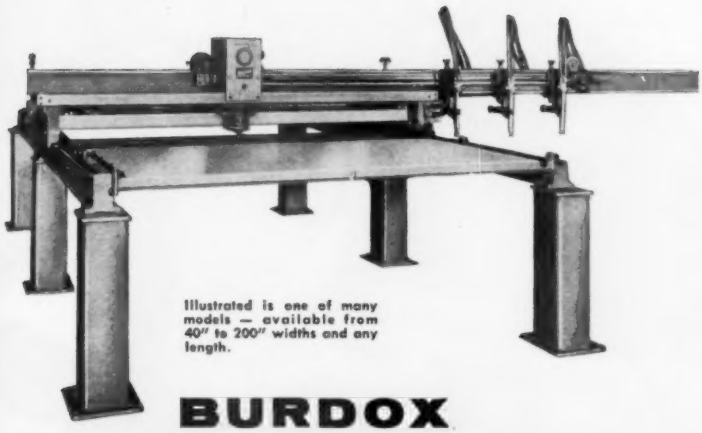


Optoscope Manual Tracing Head



Photoscope Electronic Tracer





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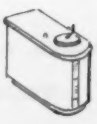
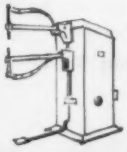
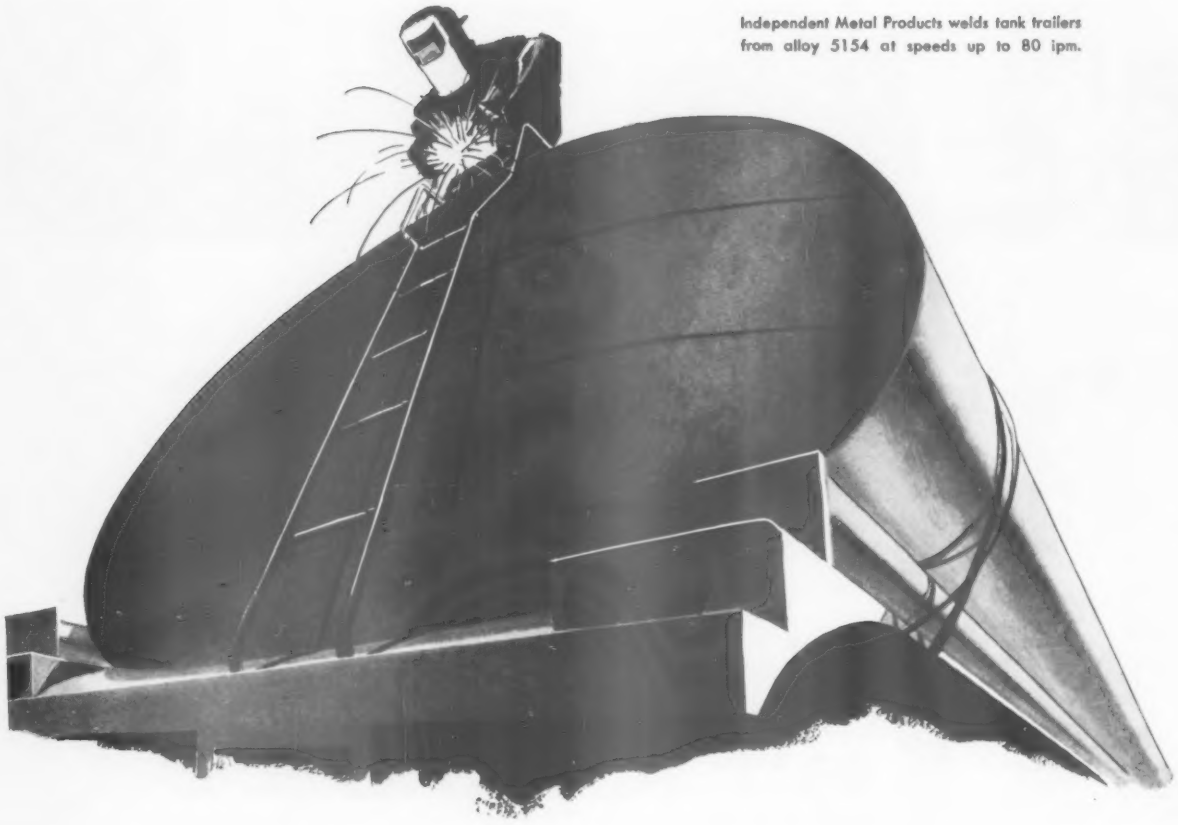


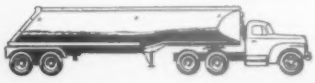




Independent Metal Products welds tank trailers from alloy 5154 at speeds up to 80 ipm.

They're welding aluminum tank trailers at speeds up to 80" per minute!

Alcoa's 5154 alloy is going over big with trailer builders such as Independent Metal Products Division of Fruehauf Trailer Company.



It has good forming characteristics combined with great strength and ductility in welded sections. Moreover, it can be welded at speeds up to 80 inches per minute by the inert-gas shielded arc consumable-electrode welding method.

Production welds of alloy 5154, using parent alloy for filler wire, have excellent ductility . . . 39% elongation in the weld metal when a joint is bent until it fails.

With these improvements, aluminum tank trucks make substantial weight savings—savings that are turned into extra payload profit. At the same time, tank shell strength is increased . . . and accident damage is reduced. Aluminum tanks absorb substantial distortion without cracking or weld failure. One large tank truck operator says:

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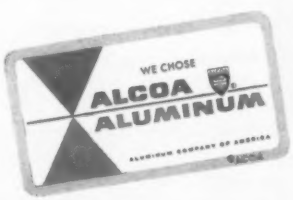

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SMILING faces belong to Morehead Medalist L. W. Stettner (right), president of Victor Equipment Co., and his vice-president and director of sales, E. A. Daniels.

At 57th IAA:

Stettner to receive Morehead Medal

By a staff member

THE INTERNATIONAL Acetylene Association has chosen as its 1956 Morehead Medalist L. W. Stettner, president of Victor Equipment Co., San Francisco.

Mr. Stettner will be honored when the IAA meets for its 57th annual convention in Minneapolis during the first three days of April. That city's Hotel Nicollet will be headquarters for the gathering.

The Morehead Medal is the IAA's top award and is presented annually to the person judged to have done most to advance the acetylene industry or the art of producing or utilizing calcium carbide or its derivatives.

The award has been in existence since 1922 when John M. Morehead established it to honor his father, James Turner Morehead.

Emigrated in 1910

The 1956 Medalist is a native of Germany who came to this country from the Isle of Pines, near Cuba, in 1910. Mr. Stettner settled in San Francisco, joining The Great Western Welding & Cutting Co. as a weldor. His inventive mind enabled him to improve the gas torches he and his colleagues were working with, and before too long, customers began to purchase Stettner-designed torches from the job shop for their own use.

As a result, Stettner was busier designing and building torches than he was welding. Thus, Great Western grew into what is now Victor Equipment Co. Mr. Stettner has been president for nearly 30 years.

Canadian Keynote Speaker

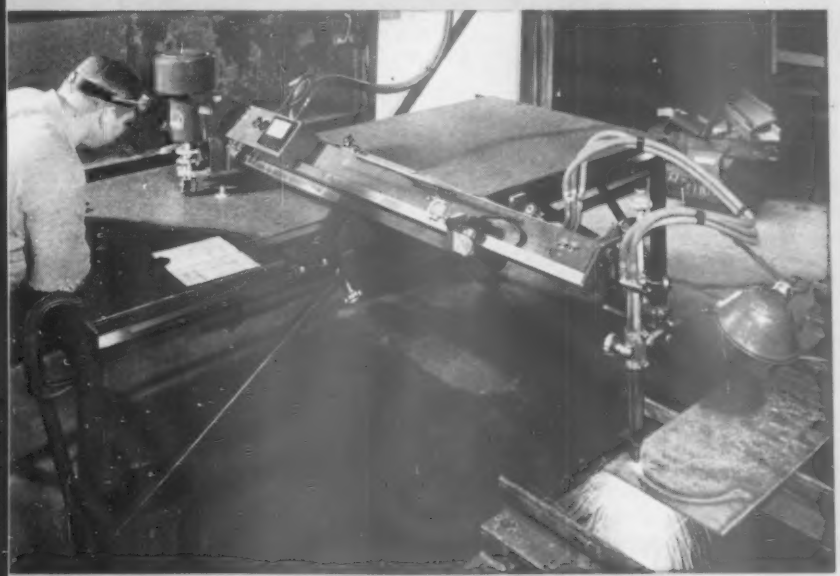
Convention registration will be held in the Nicollet's ballroom lounge. Keynote speaker at the opening luncheon Monday will be the Honorable George C. Marler, Canadian minister of transport, whose topic will be the St. Lawrence Seaway project. Presiding will be C. McL. Pitts, president of IAA and The People's Gas Supply Co., Ltd., of Ottawa, Canada.

Technical sessions will be held in the hotel on Monday and Tuesday, April 1 and 2. Business sessions will be conducted on Wednesday. Presentation of the Morehead Medal to Mr. Stettner will take place at the annual dinner (Tuesday evening).

An educational session will be conducted Tuesday morning under the chairmanship of Dr. George Slottman, vice-president of Air Reduction Sales Co. and last year's Morehead Medalist.

The technical meetings will include one on transportation (Monday afternoon) and another on chemicals and acetylene (Tuesday afternoon). Among the speakers will be Carl Underwood, vice president of Northern Ordnance Co., Minneapolis, who will present a paper on heavy cutting.

NCG "Type R" automatic cutting machines—3 of them—help speed production at the WHITING CORPORATION, Harvey, Ill., one of the nation's leading producers of foundry and railway equipment, material handling equipment, rotary shears, chemical equipment, and special machinery. Two of the machines, as shown above, are mounted on one long table to provide a 40-foot cutting length. Parts being cut in this picture are for Whiting's "Trackmobile."



MERCURY MANUFACTURING CO., Chicago, uses this NCG "Type JR" stationary cutting machine for close tolerance shape cutting of parts that go into the manufacture of their well known line of "Mercury" fork-lift trucks.

"We'd be lost without our CUT-O-MATIC portable" says Ralph Long of J & L ENGINEERING CO., Chicago. "We use it for everything from beveling heavy plate (above) to cutting strips, circles, arcs and rings in light gauge up to heavy sections."

Bring on ANY flame cutting job!

Do you do large scale cutting . . . large in size or large in quantity?

Then the NCG "Type R" is the machine for you. It lets you mount up to 8 torches at once for tremendous output. It cuts shapes up to 10 feet in diameter . . . as small as 1½ inch in diameter. A beveling device can be added for making accurate bevels of all types on plate up to 2½ inches thick. Since the "Type R" is built to order, any of its eight standard forms can be varied if necessary to meet your exact needs—and varied later, too, to meet changing needs. And it will give you long dependable performance: the first "Type R"—installed more than fifteen years ago— is still in service.

Do you need fast, accurate cutting on a medium scale?

If so, it will pay you to get the facts about the NCG "JR" cutting machine. A junior version of the big "Type R," it handles any cutting job you can think of—straight line or shapes, manual or template tracing—on plate up to 3 x 4 feet.

Do you want to mechanize hand cutting operations?

Then ask for a demonstration of the CUT-O-MATIC®—an inexpensive portable cutting machine that weighs just 30 pounds, complete with torch. It cuts circles, arcs, straights, does stack cutting, pipe cutting . . . all with production-line accuracy. An exclusive "floating torch" assembly lets you cut accurate bevels even on wavy plate.

NATIONAL CYLINDER GAS COMPANY
840 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS
Branches and dealers from coast to coast

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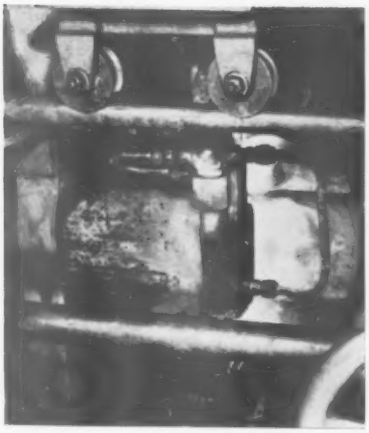
When you work with metals . . . work with NCG®

No matter what the job . . . in cutting, welding, brazing, or metal conditioning . . . NCG has the equipment, the experience and the organization to serve you better.

VISIT OUR BOOTH 244 — WELDING SHOW
APRIL 9-11, 1957 • PHILADELPHIA, PA.

ELECTRODES AND GAS RODS ★ ARC-WELDERS ★ CUTTING MACHINES ★ HIGH PURITY GASES
CUTTING AND WELDING TORCHES ★ WELDING AND CUTTING ACCESSORIES

HALF-millionth rail emerges from shop after welding, heat-treating and grinding operations.



ABOVE: Close-up of welding operations shows four-sided, multi-torch arrangement to provide thorough heating. BELOW: Long view of welded rail entering heat-treating unit. When rail has been properly stress-relieved, it will be allowed to cool and metal upset from joint area during welding will be ground off.

500,000 welds— and more to come

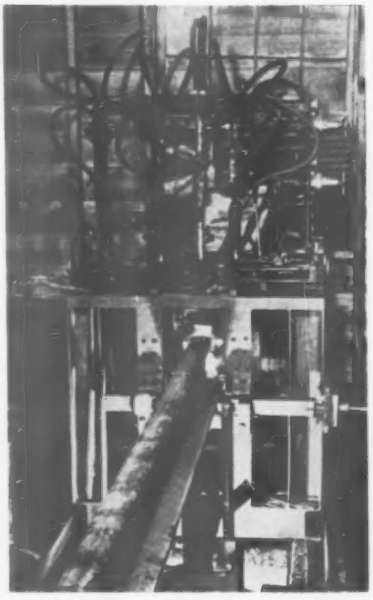
AFTER 18 years of steadily increasing acceptance, the oxyacetylene pressure welding process has turned out its 500,000th rail weld at the Conway Yard of Pennsylvania Railroad.

The milestone joint was made in a 155-lb rail destined for main-line use near Charlestown, Md.

A large part of the half-million pressure welds which have now been completed on rails were done in the past two years. During this short period, rail welding programs have been started by almost every major railroad and by many smaller roads.

More than 180,000 rail welds for yards, bridges, stations and main lines were made in 1956, according to an estimate by Linde Air Products Co. The firm feels welds during 1957 should exceed the 250,000 mark.

Pressure welds are expected to reduce track maintenance costs. And, because the welding process has been constantly improved, welding is now being done at a cost competitive with that for bolted joints.



LEFT: Flexibility of welded rails is demonstrated as cars loaded with rails round an "S" curve. Milestone rail shown above performed in same manner when taken on flat cars to installation point near Charlestown, Md.

Aluminum Welding Cable

Makes Your Job Easier!

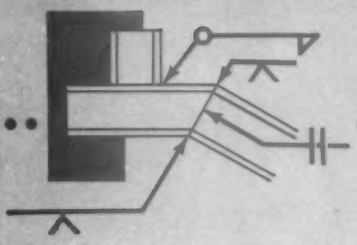
Saves Effort!

Lighter weight and superior flexibility lets you weld faster and easier on every job . . . less operator fatigue!

Type D-866 *Aluminum* Welding Cable is available in all standard sizes from General Cable.

General Cable . . . *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y. Offices and Distribution Centers Coast-to-Coast



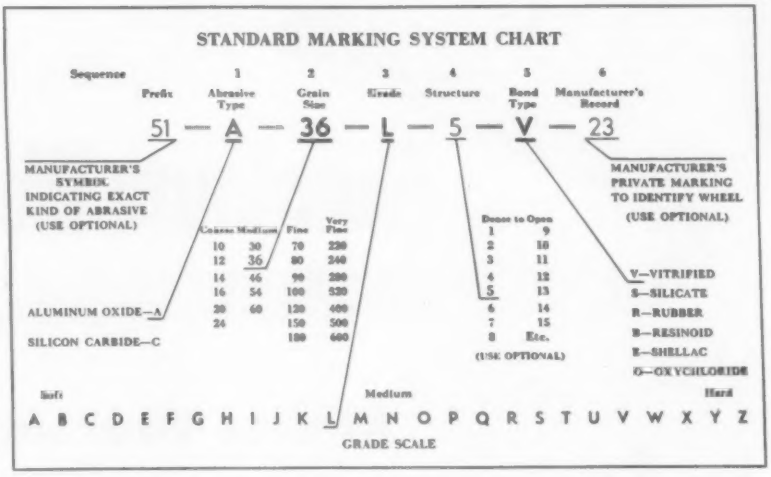
the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Tips on grinding wheel selection

Question:

In the past months, many readers have requested basic information on grinding wheel selection. The following statements represent a general answer which should cover those points most frequently cited in the letters we have received.—The Editors



Answer:

The grinding wheel that is ideally suited for the finishing job to which it will be applied is one of industry's most accurate and helpful finishing tools.

To achieve a good mating of tool to job, the user must possess a full understanding of the differentiation between a grinding wheel's hardness grade, abrasive type, bond type and grit size.

It is the correct combination of these elements which helps the user perform his operations quickly and economically.

Hardness grade does not indicate hardness of the abrasive—it is a term which describes strength of the bond used to hold abrasive grit together and to the wheel. There are 26 grades of hardness shown in the chart accompanying this article—one for every letter of the alphabet

Self-Sharpener

When bond of tougher quality is used, a hard-grade wheel will retain its grit longer. The softer-grade wheel releases dull grains more quickly to uncover a new layer of sharp grains.

Because of this speedier renewal of sharp surface grains, a soft-grade grinding wheel is recommended for use on hard metals. Conversely, the hard-grade wheel should be applied to softer materials. The abrasive grit will last longer on such an application, and its cutting action should be fully utilized.

Grit size, also, must be varied to meet individual job requirements. On large contact areas, a coarse grit is needed so that metal chips can pass freely through the grains and out of the grinding area. Fine, closely-spaced grit will become clogged with chips when a large area must be covered at one time.

Abrasive Type

This same fine grit, however, is ideally suited for grinding on small contact areas. Size of contact area, incidentally, is also a factor in selection of wheel hardness grade. For essentially the same reasons described above, a soft-grade wheel is best for large areas; on limited areas, the hard-grade wheel does a better job.

Selection of abrasive type may generally follow the rule that aluminum-oxide abrasives are best for steels; silicon-carbide abrasives perform best on cast iron, nonferrous and nonmetallic metals.

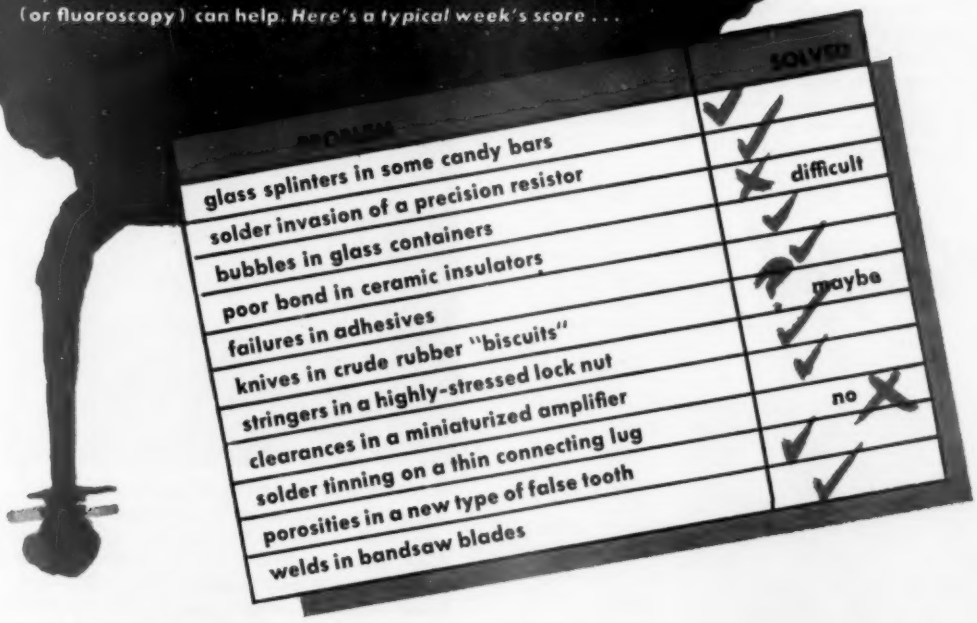
As evidenced in the marking chart, these are the only available abrasive types. In the selection of bond, however, the user has a wide choice.

A vitrified bond is selected in the chart as an example; in actual fact, it is a common and popular choice. Used for commercial finishes at high speeds, it does an efficient and economical job wherever it can be used. Such bonding materials as rubber, shellac and resinoid are used in those applications demanding top-quality finishes.

If material will be wet during grinding, wheel choice is dictated by material size, its hardness, and amount of stock to be removed. If metal must be ground dry, select a wheel one grade softer than might ordinarily be used.

HIDDEN flaws in your products need detecting?

Every day brings new inspection problems to Picker for possible solution. More often than not, radiography (or fluoroscopy) can help. *Here's a typical week's score . . .*


PROBLEM
SOLVED
glass splinters in some candy bars
solder invasion of a precision resistor
bubbles in glass containers
poor bond in ceramic insulators
failures in adhesives
knives in crude rubber "biscuits"
stringers in a highly-stressed lock nut
clearances in a miniaturized amplifier
solder tinning on a thin connecting lug
porosities in a new type of false tooth
welds in bandsaw blades
difficult
maybe
no

Makes no difference *what* you make or buy or sell . . . if it needs "seeing into" for quality control, radiography (gamma or x-ray) can probably profit you.

Talk it over with your local Picker representative * or write us outlining your problem and, if possible, sending typical samples. We'll make tests and tell you frankly whether radiography holds any promise for you. ***Costs you nothing to find out . . . maybe it's costing you a great deal right now NOT TO.***

* *There's probably a Picker district office near you (see local 'phone book).*

Picker x-ray

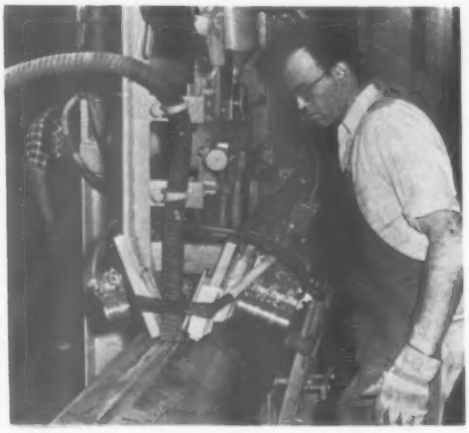
PICKER X-RAY CORPORATION
25 South Broadway, White Plains, N. Y.

Picker... your one source for Everything in Radiography and Fluoroscopy

UNUSUAL welding techniques are cutting installation time by 10% for Bowles Neon Sign Co., Houston. Standard 3/16-in. electrodes (with maximum of 300 amp) are used to cut support pipes and angle irons for neon signs to prescribed lengths. For maximum mobility, 200-amp General Electric welder is mounted on same truck bed with rigging boom.

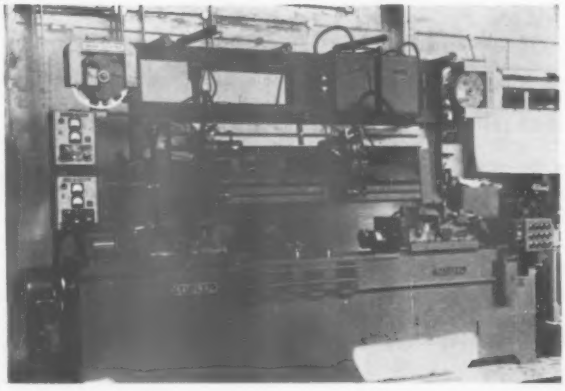
MYRIAD toggle clamps and lightweight manual positioner are employed in joining front-end guard section for heavy earth-moving equipment. T.P.V. Metal Products Co., Cleveland, specifies E6013 electrodes for welding this 12-gage mild steel.

On the job...



SPEEDS exceed 100 ipm in automatic submerged-arc welding of longitudinal seams of steel tank shell at Rheem Mfg. Co., South Gate, Calif. Shells for hot water heaters are made from 10 and 14-gage sheet thicknesses. Limit switches control sequence of operation on this unit, manufactured by Linde Air Products Co. *(For other Rheem welding applications, see* WELDING ENGINEER, *March, 1956, page 30.)*

FIVE similar, dual-head, automatic CO_2 arc welders—symbols of automation—were designed by National Electric Welding Machines Co., Bay City, Mich., for automotive parts producing plants. ABOVE: This model, which makes two sets of intermittent fillet welds, joins mounting rims to tubeless truck-tire rims. RIGHT: Another machine welds end fittings to automobile torquetube assemblies. It boasts automatic transfer device for carrying work to pressing, welding and ejecting stations. Pressing station is hydraulically operated.



Wipe away your spatter problems with this amazing silicone compound. Just apply ready-to-use X-7 to spatter area before arc welding, then whisk away spatter with a dry cloth. It's that easy! Odorless, non-flammable. Economical to use, too. Available in 1-gal. cans, six to a case. See your nearby LINDE Distributor or write for free booklet today.

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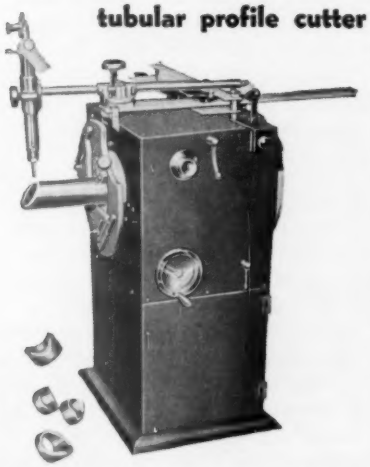
woerner

tubular profile cutter



It's versatile! You can make all types of precision flame cuts on pipe or tubing with this machine; angles, miters, saddles, bevels, spiral slots, notches, cams, serrations, and many different shapes or profiles.

See your welding supply dealer, or write direct for descriptive folder.

NICKELSON
Tool & Die Company, Inc.
1107 South West Street
WICHITA KANSAS

30 YEARS AGO

(Taken from *The Welding Engineer* of March, 1927)

The Stoody Welding Co., Whittier, Calif., will construct a new steel-frame addition to its plant. The present plant of sawtooth-roof, steel-frame construction, was completed only last June.

—30 YEARS AGO—

United Welding Co. has just been incorporated at Middletown, Ohio, by W. W. Petry, W. R. Crane and C. W. Shartle, Jr.

—30 YEARS AGO—

James E. Ferguson Co., Buffalo, N. Y., has moved to larger headquarters at 1597 Main St., in that city.

—30 YEARS AGO—

W. A. Slack, president of Torchweld Equipment Co. has been on an extended business trip through the western United States during the past few weeks.

—30 YEARS AGO—

Brown Bros. Welding Co., San Francisco, is presently constructing a single-story building, 300 by 300 ft, with 50-60 ft roof trusses. This is a completely welded building.

—30 YEARS AGO—

Linde Air Products Co., New York City, is planning to erect a plant in Duluth, Minn., and one at Houston.

—30 YEARS AGO—

Reduction of power house costs is the subject of an article about the construction of the New York City Edison East River Station.

—30 YEARS AGO—

New coast guard cutter **Northland** is reported to utilize welding more extensively than any ship of its size to date. The cutter was built by Newport News Shipbuilding & Drydock Co.

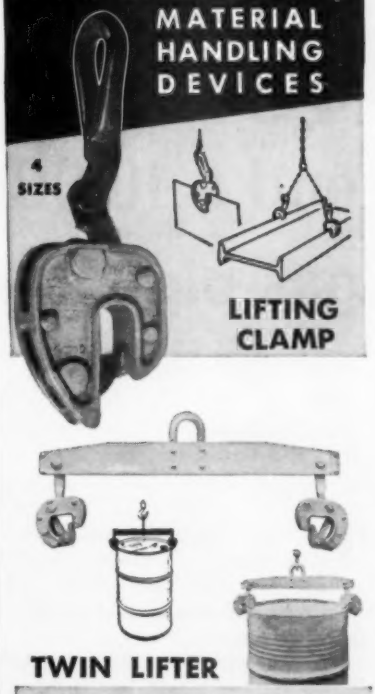
—30 YEARS AGO—

An article relates the savings to the American economy through the use of oxyacetylene welding—netting industry an annual saving, so the article states, of 400 million dollars.

—30 YEARS AGO—

Kansas Oxyacetylene Co. has begun operation of its new air liquefaction plant in Wichita. This is reported to be the first oxygen plant erected in Kansas. C. D. Stewart is plant manager.

YOUR BEST MOVE... MOVE *with* MERRILL MATERIAL HANDLING DEVICES



For Interesting Information write

MERRILL BROTHERS
56-81 Arnold Ave., Maspeth, N. Y.

WELDING operations take place in space under floor of Mersey River tunnel.

English weldors end a 10,000-mile gas-pipe system

By John Grindrod

THE LAST LINK in the great Lancashire-Cheshire (England) gas grid system has been positioned and welded beneath the floor of the Mersey River tunnel.

The entire system embraces some 10,000 miles of mains, joining Manchester with Liverpool and supplying more than 50 industrial centers on both sides of the Mersey.

Ten months in the making, the new main consists of 18-ft lengths of ⅜-in.-thick, high-tensile steel. All bends were specially drawn from ½-in.-thick steel.

Although gas will be transmitted through the main at pressures no greater than 5 to 7 psi, all welded joints have been tested for a minimum pressure of 100 psi. The entire line has been hydraulically tested to nearly 200 psi.

Truck-Mounted Crane

Engineers in charge of welding operations state that the main will withstand pressures of 1,000 psi at every joint. The pipeline is claimed the safest in the world.

Supplied by Stewarts and Lloyds Ltd., the 6,580 ft of 18-in. ID steel tubes were delivered by truck from Glasgow, Scotland, and unloaded in the Mersey Tunnel between 11 pm and 5 am when traffic was light. A small, truck-mounted crane was used to unload sections, each weighing three-quarters of a ton, at an emergency exit on the Birkenhead end of the tunnel.

The sections, comprising 380 pipes and 40 bends, had to be passed through a door in the side of the tunnel, turned within the space of a spiral staircase and lowered into a 30 by 40-in. manhole. After being passed through a pump-room, pipe sections were dropped into the space under the tunnel roadway.

Once in the under-roadway space, pipe sections had to be hauled as far as two miles by a small diesel truck as work progressed toward the Liverpool end. This truck, as well as the welding generator, had to be dismantled for access into the lower tunnel where both were re-assembled at this almost inaccessible site.

It was possible to deliver only eleven pipe sections per night into the lower tunnel.

Temperature Changes

To insulate gas main from tunnel bed, each length of pipe was laid on special plastic cushions resting on concrete joists. At each end, the main rises vertically up two of the tunnel ventilation shafts: one at St. George's Dock, Liverpool, and the other at Sydney Street, Birkenhead.

They are then connected to 18-in. cast-iron mains of the grid system. At each end of the main below the ventilation shafts allowance had to be made for expansion and contraction of piping due to temperature changes.

Under the tunnel roadway, pipelaying and welding could be carried out during the day, but this operation could be performed only at night in the ventilation shafts. About twenty men were employed on the project.

Mild-steel, all-position electrodes were used in welding pipe sections, and each weld was inspected in five sections by gamma-ray photography. For this purpose, a radioactive isotope was obtained from the Atomic Energy Commission and pushed into the pipe on a rod until opposite the weld.

A strip of film was strapped over the weld and exposed for about ten minutes. Only flawless welds were approved; joints which showed slight imperfections were cut out and re-welded.

Gas Control Room

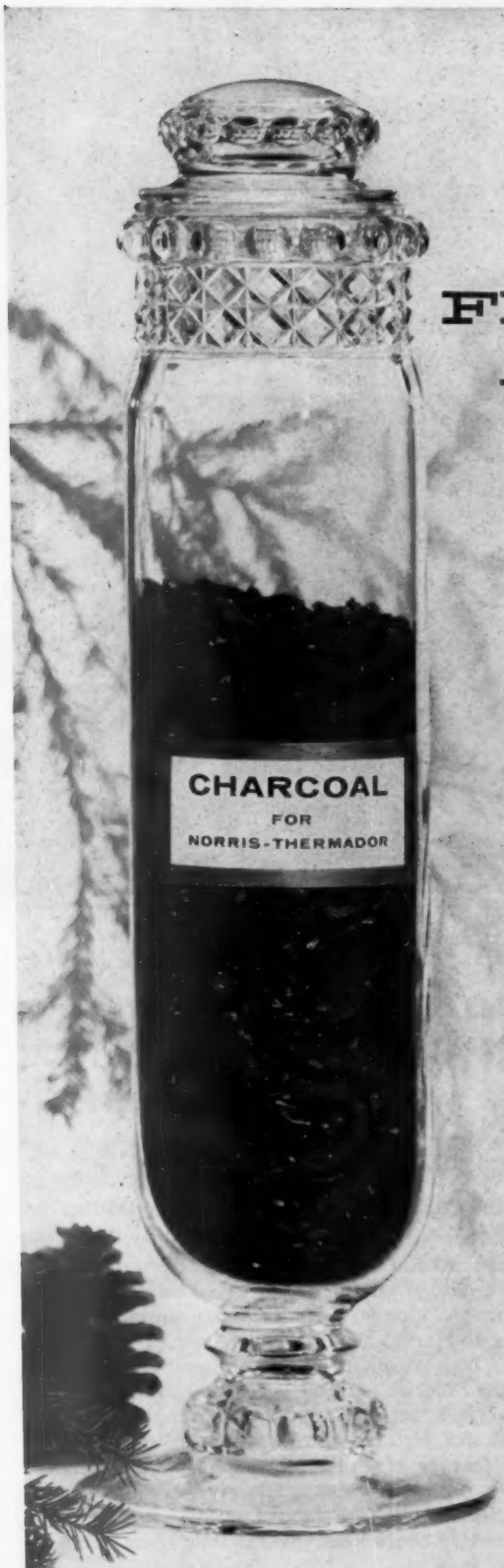
After a joint was approved, the weld was scraped and painted with red lead by an operator slim enough to negotiate the 18-in. pipe. He was helped along the pipe by a small trolley place under his chest. When his job was completed, he was pulled out by a rope attached to his legs.

Gas flow through the Mersey Tunnel main can be remote-controlled from the Duke St., Liverpool, control room of the Liverpool Gas Group. Two valves at either end of the tunnel can be shut in less than one minute.

A direct telephone line connects the Mersey Tunnel control room with the gas control room so that any trouble can be reported immediately.

Initially, gas will be sent from the Birkenhead side of the tunnel to augment Liverpool's supply. In two years' time, when an extension to the North Western Gas Board's Garston works is brought into production, transmission will be reversed and 3 to 6 million cu ft of gas will be sent in the other direction.

Contractors for the project, which cost around $420,000 were William Press & Sons Ltd., of Tottenham, London.



Acetylene Cylinders...

FILLED WITH APOTHECARY PRECISION

Filling a Norris-Thermador Acetylene Cylinder with charcoal monolithic filler for outstanding welding performance is as exacting as filling a medical prescription. Ingredients must meet rigid Norris-Thermador standards and are compounded with apothecary precision. For example, we go to the State of Washington for the particular fir used to make charcoal of a prescribed texture. Other woods do not provide the qualities necessary. Proper combination of the charcoal with three other filler components—diatomaceous earth, asbestos, and cement—produces a monolithic filler with high porosity and permeability. As a result, Norris-Thermador Acetylene Cylinders take more gas faster and fill more uniformly.

Undeviating accuracy at every step assures utmost value and serviceability for every cylinder user.

EXTRA FEATURES Cold-drawn construction... lightweight for easy handling... bases curled *under* for maximum strength and compact storage... larger cap holes... tags easily read without having to remove them... all welding X-ray controlled... specifications ICC-8 met and exceeded.

Acetylene Cylinders from 10 to 300 cubic feet capacity

Write or wire for specifications on all sizes. Cable Northerm.

3-1077

NORRIS-THERMADOR CORPORATION

5215 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA. DEPT. WE-357

Transport tank begins to take shape, as butt joints are welded to form outer shell. Heil Company is one of the top producers of aluminum transport tanks.

Switch to Fillerarc* equipment boosts

PRODUCTION RISE ATTRIBUTED TO FASTER WELDING, FEWER REJECTS

Building aluminum transport tanks that must withstand pressures of 34,000 pounds per square inch requires welds that are near-perfect . . . leakproof.

At the Heil Company, Milwaukee, Wisconsin strict tests show that more tanks welded with General Electric automatic and semi-automatic welders are leak-free than those welded with any other equipment they have used or tested.

Rejects have been cut so much since the switchover to General Electric Fillerarc equipment that production has jumped 35%.

Increased speed of welding is also helping to boost production at Heil. The automatic current regulation and constant arc length features of the equipment enable weldors to set the generators once and then forget about them . . . even if they change wire speed in the middle of a job.

Reg. trademark of General Electric

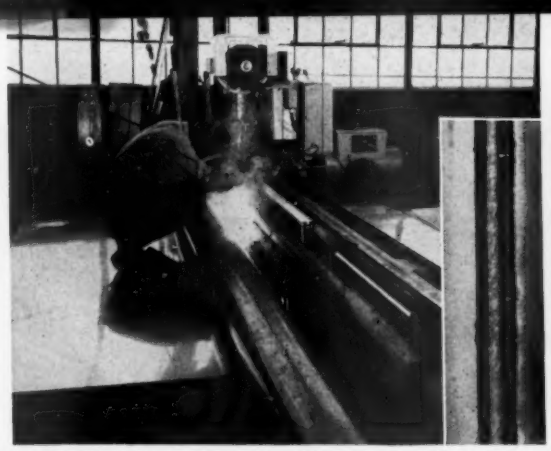
This saves the time previously spent crawling in and out of the tank bodies to change settings.

WIRE PULLING FEATURE REDUCES JAMMING

Weldors are enthusiastic over the fact that the Fillerarc gun pulls the wire to the work instead of pushing it. Using fine $\frac{1}{16}$" aluminum wire, Heil had experienced considerable kinking with previous equipment. According to Harold Woda, weldor-fitter, "We couldn't weld an hour straight without it jamming up. Now, using the Fillerarc gun, the wire never jams," he says.

Bill Dyble, supervisor of welding engineering and research for Heil, is pleased with the constant arc length feature of Fillerarc welders. "Constant arc voltage prevents burnback," he says. "Before switching to Fillerarc welders some of our operators spent as much as two hours a day overhauling their torches."

GENERAL ELECTRIC



FIRST STEP IN TANK PRODUCTION is joining sheets of 5/32" thick aluminum alloy, type 5154. Automatic Fillerarc welding is used here. Inset shows sample of weld obtained.

COMPARTMENT SECTIONS SECURED with semi-automatic Fillerarc welders. Wire drive, argon gas cylinder are on cart for easy portability.

WELDOR ADJUSTS WIRE SPEED with remote-control unit . . . no need to crawl out of tank. Automatic current and arc-length features of equipment take care of the rest.

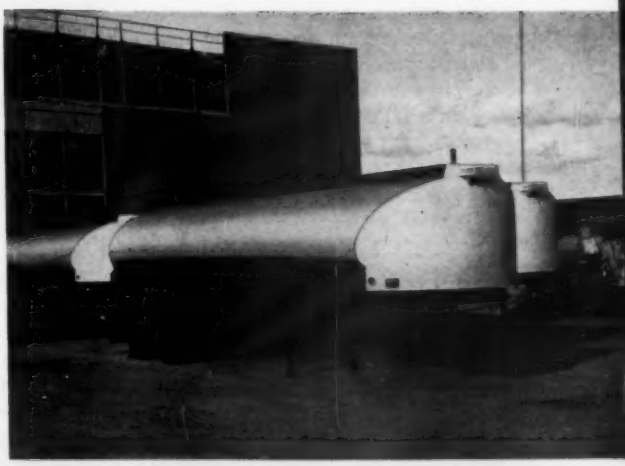
COMPARTMENT SEPARATORS ARE WELDED on special holding fixture. Wire pulling Fillerarc gun reduces jamming, cuts maintenance time.

tank production 35% at Heil Company

Fillerarc welding is General Electric's consumable-electrode, gas-shielded process for either semi-automatic or automatic welding. Now, using carbon dioxide gas as the shielding agent, the Fillerarc system is ideal for mild steel applications. It is fast, economical, clean (no messy flux to bother with), AND, the welds obtained are sound, weld after weld.

For a demonstration of the Fillerarc process, contact your nearby General Electric Welding Distributor. He is listed in the yellow pages of the telephone book. Or, write for more information to Section 713-8, General Electric Company, Schenectady, New York.

Be sure and see the General Electric display at the American Welding Society show, April 9–11, Convention Hall, Philadelphia, Pennsylvania, booth No. 322.



FINISHED PRODUCT—an aluminum petroleum tank, fabricated with Fillerarc welding equipment. Capacities of these tanks run from 3,000 to 9,000 gallons.

"I like Airco 78E Electrodes because slag is so easy to remove"

Easy slag removal is just one of the many advantages of Airco 78E electrodes. This deep penetrating, all position electrode produces high quality weld metal which sets up rapidly. It is free from porosity, even when welding in the vertical down position. Especially recommended for welding mild steel where high ductility and tensile strength are essential.

This is but one of many electrodes in Airco's complete line that also includes stainless steel, hardfacing, cast iron, general and special purpose electrodes. Send for the free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318-WE.

AIRCO

AIR REDUCTION

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On the west coast—
Air Reduction Pacific Company
Internationally—
Airco Company International
In Cuba—
Cuban Air Products Corporation
In Canada—
Air Reduction Canada Limited

WORN sheepsfoot tamper boot is rebuilt by weldor using hardfacing wire and semiautomatic welder.

—Courtesy Stoody Co.

REBUILT boot is being removed. Mold shapes large weld puddle to original tamper boot contour.

Welder cuts costs in rebuilding tamps

A TRIPLE-threat maintenance program for rebuilding sheepsfoot tamper boots at J. A. Thompson & Son, Los Angeles, Calif., depends upon a semiautomatic welder for much of its success.

The program reduces welding time in the shop, cuts field downtime in half, and substantially reduces part costs.

The contracting firm operates about 24 sheepsfoot compactors, averaging approximately 220 individual tamper boots to each unit. Proper maintenance of this equipment by manual welding had resulted in an excessive drain on shop time.

In the past, new boots generally were hardfaced before installation in a circle-and-cross pattern. However, these protective beads wore through after three or four months of service. Gage was then lost completely within a few additional days.

Semiautomatic Welder

Consequently, the shop had to replace worn tamper boots with new or rebuilt parts every six months.

Using the old method, a worker did well to rebuild 18 worn boots or hardface 30 new parts in an eight-hour shift. Often, when the shop's schedule was heavy, boots had to be put into service without any protection.

The new procedure uses a semiautomatic welding machine to complete the rebuilding job in only a matter of minutes. A weldor can easily turn out 70 tamper boots in a single 8-hour shift.

A worn tamper boot is placed with its wearing face up in a graphite-type split mold. Hardfacing wire is then applied through the semiautomatic welder.

Impact Strength

The mold has two purposes: *(1)* it shapes the large welding puddle to original tamper boot contour, and *(2)* it serves as a gage to indicate correct length. The mold method also assures that the hard metal goes on where it does the most good— on the perimeter of the boot where gage is critical and wear is extreme.

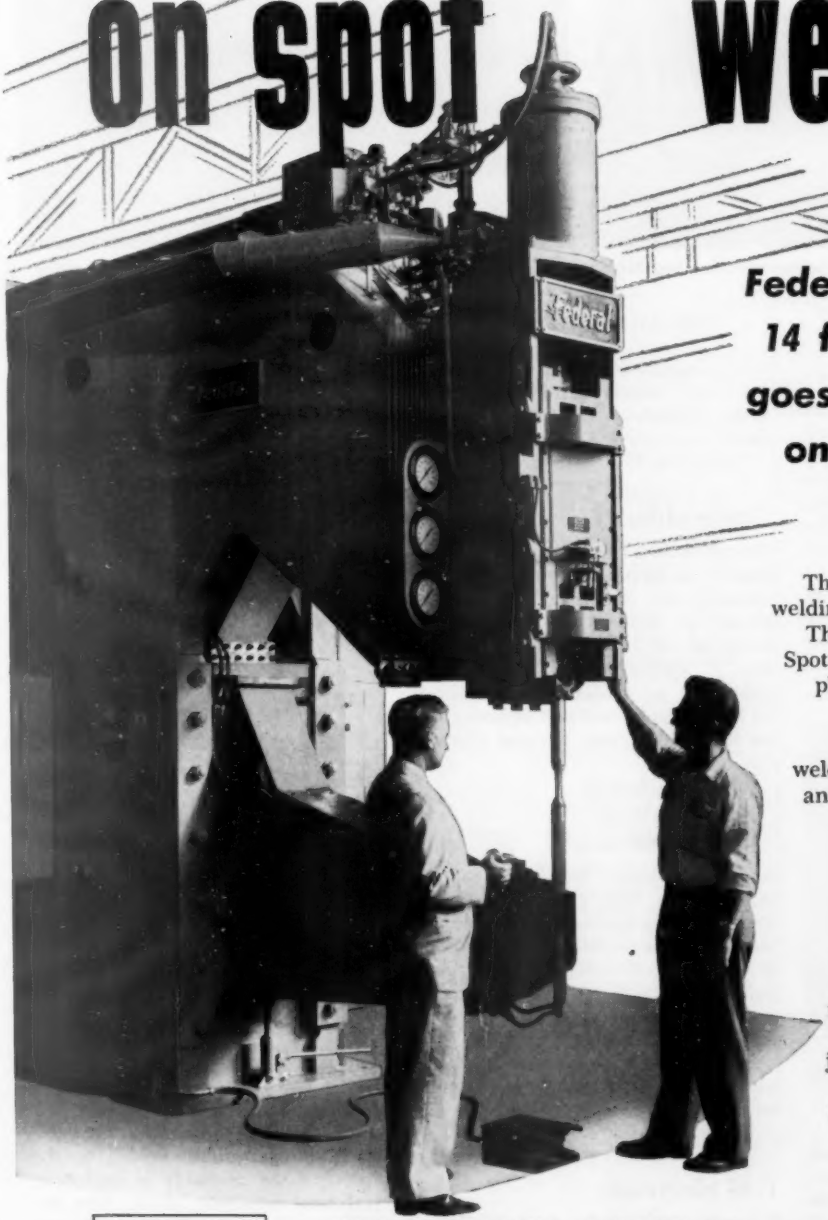
Impact strength of the deposit is demonstrated by its ability to stand up under blows of a 12-lb sledge used to seat and align the boots during installation.

Gage is particularly important in road work or earth dams where specifications are stringent and inspection rigid. Tamper boots repaired by the new method were said to be still in gage after nearly four months of service.

Such rebuilt parts retain their size at least twice as long and cost less than original factory replacements. A worn boot can be salvaged for approximately 45% less than was previously spent for a new part and its hardfacing.

Considering that this firm has more than 5,000 tamper boots in service, the potential saving seems well worthwhile.

...the BIGGEST story on spot welding!



Welding engineers testing record setting spot welder. Federal has been commissioned to build several more of these giants for aircraft manufacture.

Federal Built 14 ft., 28 ton giant goes into operation on west coast . . .

The biggest thing in aircraft spot welding—that's the huge new Federal Three Phase Frequency Converter Spot Welder designed to make spec plus welds on the tail section of a new commercial jet airliner.

More than 13 feet tall, the big welder weighs over 58,000 pounds, and has a special throat, or work clearance area, of some 2500 square inches.

The design and manufacture of the 12 ton unipolar transformer having an output in excess of 100,000 amperes and the requirements of meeting rigid deflection specifications on this large throat machine were just a few of the new problems encountered on this project. Federal experience and facilities once more provided the correct solutions.

Here again, is proof that large or small—standard or special—*Federal Stays First in Resistance Welding.*

Federal WELDERS

Warco PRESSES

The Federal Machine and Welder Co.

WARREN, OHIO

new products . . . . . USE CARD ON PAGE 105

FLEXIBLE and fire-resistant, welding curtains and tarpaulins offer ideal protection in the field.

FIELD crew installs new welding neck anchor forging in a 30-in. line at Eunice, La. The forging was later imbedded in a concrete block.

Welding curtain

VERTICAL and horizontal protection is offered by "StaSafe" welding curtains and tarpaulins. Both are impregnated with flame-resistant Neoprene. Curtain is made of strong lightweight, flexible glass cloth; tarpaulin is made of woven asbestos. The Neoprene impregnation prevents oil and grease saturation, eliminating a fire hazard and increasing service life. *Standard Safety Equipment Co.*

Circle No. 1.

Grinding wheel

EXPANDING grinding wheel, mentioned in February *WeldWorld*, has interchangeable rubber segments which grip coated abrasive to form grinding surface of the "Flexcore." Replaceable segments are available in various hardnesses.

Complete peripheral contact is made with coated abrasive band. Wheel diameters of 3-6 in. are available, in any desired width. New line uses the same length of abrasive bands as "Aircore" inflated grinding wheels of same diameter. *Nu-Matic Grinders, Inc.*

Circle No. 2.

Arc welder

TRANSFORMER welder is designed primarily as a power source for submerged arc welding. This single-phase, a-c welder has an operating range of 325-1000 amp. Remote control of welder output and primary contactor is available in addition to the controls mounted permanently on the welder case. *General Electric Co.*

Circle No. 3.

Gas saver

EASILY installed, the "GasXpandr" is made for Mig (metal inert-gas) and Tig (tungsten inert-gas) welding. Its purpose is to obtain maximum efficiency from shielding gases (argon, helium). It takes advantage of maximum heat expansion to provide economy in gas consumption. Unit is a heating element capable of generating 1,200 F; it operates on 110 volt, a-c/d-c. *H. I. G. Corp.*

Circle No. 4.

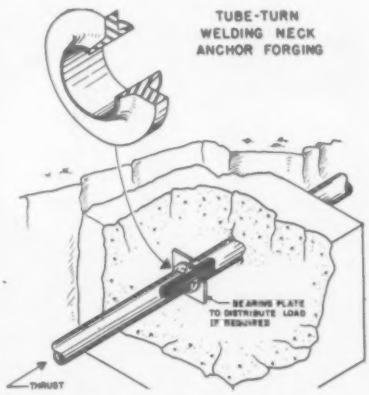
L-H electrode

KNOWN as "Hardalloy 32," this iron-powder low-hydrogen electrode is said to deposit impact and abrasion resistant weld metal. Electrode can be used with a-c or d-c on carbon steel and austenitic manganese steel. *The McKay Co.*

Circle No. 5.

Welding anchor

AN IMPROVED neck anchor forging is specially designed for high-pressure welded oil and gas pipelines. It is also said to be ideal for compressor stations, river crossings and valve and meter settings.



DRAWING shows cutaway view of the new welding neck anchor forging. Note bearing plate which distributes load if required.

The anchor is a double-hubbed flange with no bolt holes. Straight-taper hubs are butt welded to the pipe, and the assembly is buried in reinforced concrete block. The anchor is available in conventional flange materials and a variety of sizes. Notable feature of the anchor: it permits flange material with 35,000-psi minimum yield strength to be joined to 52,000-psi pipe. *Tube Turns.*

Circle No. 6.

ACCESSORIES FOR GAS WELDING

AIRCO RODS FOR WELDING STEEL

#1 is designed for welding low carbon and low alloy steels including grade A and B pipe.

#4 is a low priced, general purpose, high tensile steel rod.

#7 mild steel rod is used for every day welding of sheets, plates, etc.

AIRCO GOGGLES

Cover goggles protect eyeglasses and shut out glare. Fit over any type of eyeglasses.

Welding and cutting goggles give excellent ventilation without light filtration.

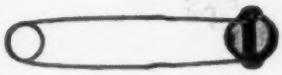
Airco replacement lenses available in all densities to fit your frames.

AIRCO GLOVES

Tough #1 Carpincho leather . . . suitable for gas or arc welding. Other glove types available include horsehide and asbestos models.

AIRCO WELD-CLEANING TOOLS

Atlas Model A Dual Tool consists of a combined chipping hammer with chisel head and detachable wire bristle brush.



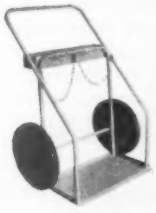
AIRCO SPARKLIGHTER

For instant lighting of gases. A hood directs sparks. Round renewal flint tips are replaceable.

AIRCO-TWIN HOSE

Two neoprene lined, rayon cord reinforced hoses molded into a single unit . . . doesn't kink.

With or without connections. Meets I.A.A. specifications.



AIRCO CYLINDER TRUCK

Two-wheel hand truck assures good balance. Semi-pneumatic tires. Strong, rigid, welded steel frame. Other large-wheeled models for soft, uneven or rough surface conditions.

ATLAS CAST IRON WELDING FLUX

Floats out oxides and impurities to assure sound cast iron weld metal. Apply by dipping heated end of filler rod into the flux.

MARVEL BRAZE WELDING FLUX

The general purpose flux . . . remains molten and viscous over a wide temperature range. For conventional welding and braze welding of cast iron, malleable iron, steel, copper, brass and bronze.

HI-TEST BRAZE WELDING FLUX

For braze welding with brass rods on steel, malleable iron or other metals. Provided in paste form to permit uniform application to both work and rod.

AIRCOSIL SILVER BRAZING FLUX

Entirely fluid at 1100°F and remains fluid and active over a wide temperature range. Use with AIRCOSIL alloys when silver brazing stainless steel, nickel, monel copper, brass and other ferrous and nonferrous alloys.

FREE AIRCO CATALOG

Newly revised. Presents the complete lines of Airco Welding Supplies and Accessories. Completely illustrated. Includes specifications, applications and ordering data.

Write for Catalog 9-13

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Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide — gaseous, liquid, solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetate, alcohols, and other synthetic resins.

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...to the big 5th A.W.S. Welding Show?

Philadelphia, Pa., Convention Hall
April 9-10-11, 1957

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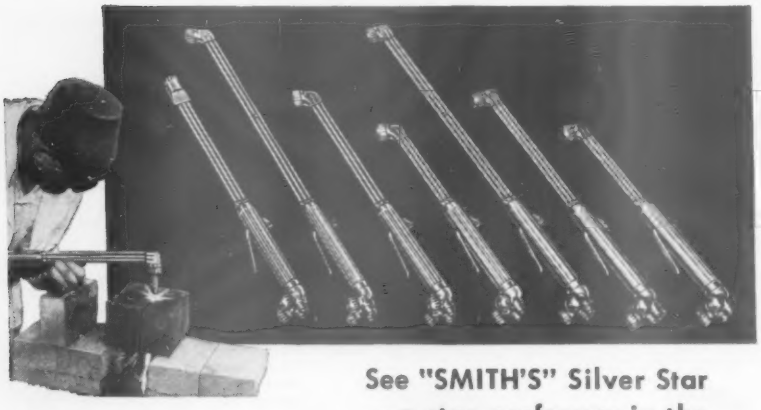
And we'll have some interesting new equipment and demonstrations to show you
Stop in and see us! (Booth 113)



See "SMITH'S" Silver Star —a star performer in the field of Oxy-Acetylene Cutting Torches

★ Tests show average gas saving of 25¢ per hour
★ Reduces tip replacement cost as much as 50%

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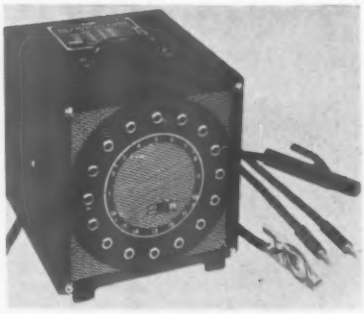

Portable welder

HAND portable industrial a-c welder is rated at 200-amp output, with 50% duty cycle. Unit weighs only 80 lb. Dimensions are 12 in. by 13 in. by 14 in. Manufacturer claims this new model compares favorably with any similar industrial arc welder of equivalent output. *Brennen, Bucci & Weber, Inc.*

Circle No. 7.

Welding filter

NEW "MIK" filtration unit was specifically developed to remove minute particles from water. It is recommended for welder cooling lines which must be kept free from frequent clogging. Unit can remove impurities to 1/10 micron at 3-10 gal per minute. Permanent cartidges are available in densities of 25, 10, 1 and 0.1 microns. *Heico, Inc.*

Circle No. 8.

Abrasive finishing

ROTARY finisher and buffer is said to have wide application for abrasive finishing, deburring, sanding, bufing and polishing of metal, plastics, etc.

A compact bench-model machine, the unit uses standard hinged roll and any type of emery cloth, sandpaper, buffing cloth can be inserted. It is available with or without disc attachment; work for disc attachment is adjustable from 45 to 90 deg. *Mathewson Machine Works, Inc.*

Circle No. 9.

Soldering sheet

ZINC-CLAD aluminum alloy, now available in commercial quantities, promises to end many problems in soldering heat-exchanger equipment. Fabricated with one or both sides clad, in coil or flat sheet form, the "Alcoa" soldering sheet reportedly opens the door to many new applications. It will help to solve joining problems, particularly in the auto-radiator field, states the manufacturer. *Aluminum Co. of America.*

Circle No. 10.

FASTER . . . EASIER HARD SURFACING

Semi-Automatically With

Wear O Matic

PRECISION DRAWN HARD SURFACING WIRES

Now you can shorten "down-time" and turn out more resurfaced or rebuilt parts per shift with semi-automatic equipment and Wear-O-Matic precision drawn hard surfacing wires. With deposition rates up to 15 pounds per hour you can easily save up to 50% of the cost of manual hard surfacing operations and yet retain the flexibility of manual welding. In addition, with semi-automatic application there is no stub or coating loss.

***See semi-automatic demonstrations of Wear-O-Matic wire.* Visit Booth 101 at the AWS Welding Exposition, Convention Hall, Philadelphia.**

Here's why Wear-O-Matic is the RIGHT WIRE for your semi-automatic applications.

More uniform wear resistance Wear-O-Matic wires are compacted to a density almost equal to solid wire resulting in a more uniform hardness and wear resistance throughout the weld deposit.

Continuous smooth feeding The true diameter and dense structure of Wear-O-Matic wire permits smooth feeding without special feed rolls or contact tubes. Wear-O-Matic wires will not crush under standard feed roll pressure.

Find out now how Wear-O-Matic precision drawn wires can improve your hard surfacing operation. Write for free literature and application manual. Drawalloy Corporation, Lincoln Highway West at Alloy Street, York 12, Pennsylvania.

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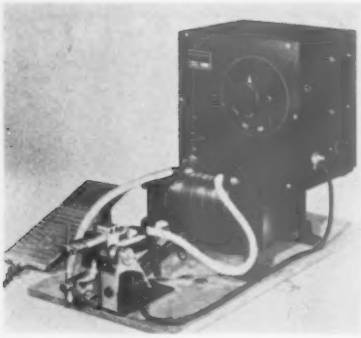
THE WIRE MILL FOR THE WELDING INDUSTRY — STAINLESS STEEL · HARD SURFACING · TOOL STEEL



Small part welding

SINGLE electrode welding head, model "TW-1," is now available in complete welding unit, including a 1 kva a-c transformer, seat control, timer and foot switch.

Designed for production hand welding of small parts, the "TW-1" can be used in electronics and allied industries for microscopic resistance welding of vacuum tube elements, transistor parts and subminiature components.

Action of foot pedal actuates upper electrode assembly and its cam, which works against cantilever spring for pressure during welding. Microswitch operating at 5% lag behind electrode closing completes welding circuit during cam dwell period. Can also be adjusted for percussion welds. A 1 kva a-c capacitor discharge power pack supplies necessary power for wide range of welding conditions. *Federal Tool Engineering Co.*

Circle No. 11.

Work lift

VERSATILE work lift, "Tilt-O-Lift," gives controlled lifting and positioning by means of crank balancing hoist. It can be used on production lines. Welding shops can use it for positioning welds. It will lift a load to 1½ tons and, by means of crank control, load can be tilted at any convenient angle for positioning. *Tilt-O-Lift Co.*

Circle No. 12.

Automatic welder

MODIFIED constant voltage welders allow better and fuller control. Line consists of 300, 500, 750 and 1,200 amp machines. Main feature is adjustable slope control giving softer arc, eliminates burn-back and stubbing, and provides stable, spray-type deposit when properly adjusted for aluminum, stainless steel and other alloys, it is reported.

Chief advantages, states the manufacturer, of constant voltage welding are simplified operation, lower installation and power costs and X-ray quality welds with inert gas, and manual and automatic welding processes. *Harnischfeger Corp.*

Circle No. 13.

Cutting torch

LARGE capacity hand-cutting torch, "Oxweld C-63" features separate oxygen lines for preheat and cutting oxygen. Torch is claimed to offer extra preheat capacity. Valves are separated from main body of torch for more convenient operation and maintenance. Flashbacks are reportedly eliminated by use of cartridge-type mixer which provides thorough and uniform mixing of gases.

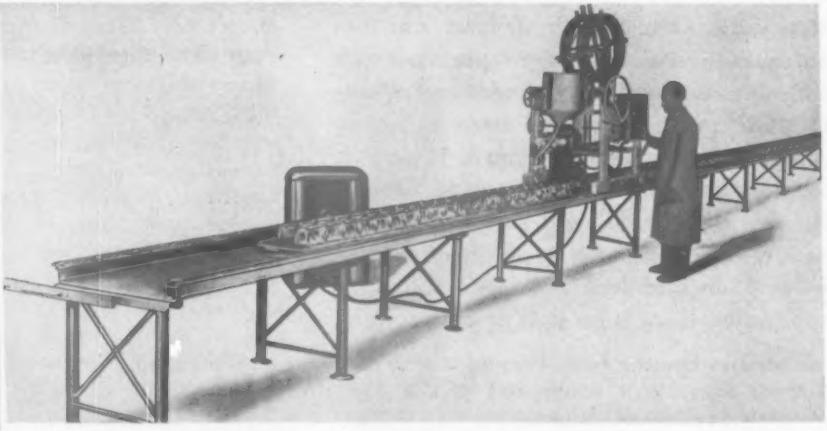
Torch is designed for use with medium-pressure acetylene. Cutting nozzles are available for other fuel gases. For special requirements, torch is available with longer lengths of stainless steel tubing to increase its normal 4 ft 9 in. length. *Linde Air Products Co.*

Circle No. 14.

REXARC KEEPS EARTH-MOVING EQUIPMENT ROLLING!

ONE VERSATILE MACHINE TO WELD ROLLERS, IDLERS AND RAILS *AUTOMATICALLY*

Rebuild Tractor Rollers and Idlers with the RP-73X Attachment



Rebuild worn tractor rails the New Rexarc Automatic way for better wear resistant service with the RM-6 Longitudinal Welder

Contact your nearest distributor or the factory direct for details

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Plant, Research Laboratories and World Headquarters

BETTER ORIGINAL FASTER

Low Temperature EUTECTIC WELDING ALLOYS

STRONGER WELDS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

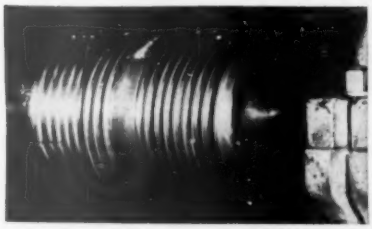
"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS

HIGH STRENGTH OVERLAYS AT LOW AMPERAGES! EUTECTRODE 680 AC-DC AVOIDS HEAT DISTORTION

A Texas chemical corporation discovered the advantages of "Low Heat Input" welding when it used EutecTrode 680 AC-DC to rebuild worn-down lands on the fifth stage piston of a giant multi-stage compressor. Heat distortion was avoided and smooth, dense, porosity free overlays obtained. Entire repair was accomplished in one operation without removing the piston from the lathe. Only enough heat to deposit ⅛" EutecTrode 680 was required. Lowest amperages (75-80) were used and preheating to 200°F. was necessary only to remove chill and moisture from piston.

An all-purpose electrode for very high alloy and carbon steel welds and overlays, EutecTrode 680 produces the best possible weld qualities, has extremely high impact, wear, and corrosion resistance, with ultimate tensile strength up to 120,000 psi. Overlays of patented EutecTrode 680 are deposited at highest possible speed and lowest amperages.

Repair of the piston proceeded with the machining away of alternate lands to approximately 3/64" below piston ring grooves, leaving remaining lands as guides for the weldor. Machined lands were rebuilt with EutecTrode 680 before remaining lands were machined off and rebuilt. All lands were then finished by machining.



"Low Heat Input" EutecTrode 680 together with close arc gaps prevented heat distortion, stress, or enbrittlement caused by conventional high heat welding materials. Faster repair with EutecTrode 680 saved downtime. Higher strength overlays have shown excellent resistance to frictional wear. *(A-51)*

EUTECTRODE 66 AC-DC WELDS SAVE 20-25% LABOR, MATERIALS, AND ACCEPT GALVANIZING

Several different types of conventional high heat welding materials failed to produce the leak-proof welds absolutely essential to a manufacturer of gas and electric water heaters. Re-welding was necessary, production costs increased, time and labor wasted.

Consulted by the manufacturer, Eutectic's District Engineer recommended EutecTrode 66, an all position electrode for low and medium carbon steels. Results were excellent. Manufacturer reported labor savings of 25%, materials savings of 20%. No re-welding was necessary. Weld appearance was greatly improved: EutecTrode 66 produced no spatter and handled extremely well in all positions. Deposits were ductile, dense, and crack-free. Slag was easily removed by chipping and welds took galvanizing beautifully. *(A-54)*

OVERLAYS OF EUTECTRODE 10 GRIND HIGHWAY ICE, WITHSTAND SEVERE ABRASION

Need for an overlay to meet severest abrasive wear led the highway department of a northern state to try EutecTrode 10. Ice removal machines used by the department consist of a five ton hydraulic ram that pushes an auger which grinds ice from the highway. Overlays of conventional "hard overlay" alloys were rapidly chipped off by the severe wear.

Highway maintenance personnel consulted Eutectic's District Engineer, who recommended EutecTrode 10, a hard overlay Eutechrom that resists severe abrasive wear. An overlay of EutecTrode 10 on one auger gave greatly superior wear. This led the department to use EutecTrode 10 for overlays on all augers. Results were excellent. Overlays are extremely dense and smooth, corrosion resistance high. EutecTrode 10, with patented "Frigid Arc" flux coating, is easy to apply at low base metal heat. It is excellent for all applications requiring high hardness at elevated temperatures. *(A-52)*

ALUMINUM PATTERN SAVED BY PATENTED EUTECTRODE 2101

Until EutecTrode 2101 was tried, this cracked aluminum pattern could not be repaired. A vee along the crack was first ground. EutecTrode 2101, first aluminum electrode with extruded flux coating, produced a quiet arc at lowest amperages. "Low Heat Input" and rapid deposition minimized warping, and 2101 produced harder deposit. *(A-53)*

Eutectic Welding Alloys Corporation
40-40 172nd Street, Flushing 58, N.Y.

Gentlemen:

I would like further free information on the following:

☐ A-51 ☐ A-52 ☐ A-53 ☐ A-54

☐ Free 170 page pocket Welding Data Book.

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Business Address _____

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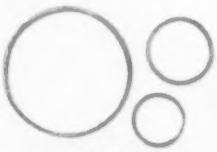
GB Silver Brazing Alloys

Sound, leak-proof joints are a MUST in hospital construction requiring the piping of Oxygen and Anesthetic Gases to wards, rooms and nurseries *for instant use!* That's why leading designers and contractors specify dependable GB Silver Brazing Alloys, Preformed Rings and Fluxes.

GB Preformed Rings, for example, assure stronger, safer everlasting joints. They save time, require less metal, meet all specifications, cost less. Perhaps life or death are not a factor when you do silver brazing, but the dependability, efficiency and economy provided in GB products are good reasons for their choice . . . especially when they cost so little.

. . . Shown above is typical installation of oxygen wall outlet, snap coupler and flow meter. GB Preformed Rings are used to braze (1) wall assembly to screen; (2) tube to regulator; and (3) tube to gauge. For complete data write today.

GB FLUXES are fully active, deep penetrating, stable and economical. Produced under strict laboratory control they are extremely effective in producing high quality joints.



GB PREFORMED SILVER BRAZING RINGS are available in a wide range of sizes for all requirements. They are easy to use, save time and labor, assure lasting results.

GB SILVER BRAZING ALLOYS are made in random coils, strips and many special shapes in addition to preformed rings. Also available is Goldsmith's Technical Service Division cooperation for competent assistance in all brazing problems.

Dealer Distributor Inquiries Invited **Write for GB Data Book**

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Mail Coupon for your FREE copy of the GB Data Book — complete information on low temperature Silver Brazing

PLEASE SEND GB Data Book without obligation.

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Welder

NEW welders are 180 and 250-amp models of the "Idealarc" a-c/d-c line. They are designed to meet the needs of job shops, light production plants and of maintenance welding crews. These units can operate either as a-c transformer types, or as d-c rectifier welders. A switch on the front panel makes the change, and all types of manual electrodes can be used with either setting. *The Lincoln Electric Co.*

Circle No. 15.

Welding positioner

WELDING positioner "5P" is for automatic and manual welding. It is power-operated for both tilt and rotation. Also featured are table T slots for easy clamping of work and adjustable elevating sub-base.

Handwheel for manual tilting of 500-lb capacity positioner can be supplied. Disconnect clutch permits free hand rotation of table top. Maneuverable push button control is included. Foot-operated control can be furnished. *Worthington Corp.*

Circle No. 16.

Automatic welder

TWO new models of automatic welders are for either carbon dioxide metal arc or submerged arc d-c welding. Each consists of a heavyduty welding head, control, operator's remote control station, and inter-connecting cables. As air-cooled units, welders require no cooling water.

Inching of wire, flux damping and arc starting are performed automatically with "SA-40A," and manually with "SA-40." Front-mounted dials permit quick, accurate setting for arc voltage and current. Welding head is capable, states the manufacturer, of driving wire diameters from 5/64 in. to ¼ in. at speeds to 300 ipm.

Head motor and gear train enclosures mount together to form single cylindrical case mounted on universal supporting frame. Two manual adjustments permit head to be rotated 360 deg in two planes. *Westinghouse Electric Corp.*

Circle No. 17.

You can save money . . .

with the K-G SINGLE STAGE REGULATOR

It costs less, right from the start, and as long as you use it.

It stays "on stream", delivers the pressures and volumes you want . . . requires virtually no internal maintenance.

Pressure check protected Nylon seat, Stainless Steel filter and working parts, hi-strength forged Aluminum body, damage-proof adjusting mechanism . . . put the K-G Series 1200 Regulator years ahead in *service*, *economy* and *performance*.

Try it and you'll be convinced . . . order from your K-G distributor, or write to K-G.

the K-G equipment company, inc.

a unit of Air Products, Inc.
PO Box 538 Allentown, Penna.

Goggle

LIGHTWEIGHT, utility goggle, "Vistaview," can be used in wide variety of hazardous operations. Large size polyethylene frame fits comfortably over prescription glasses. Louvered side and front provide ventilation yet prevents entry of flying particles. Single lense is made of shatterproof, impact-resistant plastic. It snaps in place. Goggle has clear, wide angle vision. *American Industrial Safety Equipment Co.*

Circle No. 18.

Marking kit

REFLECTIVE marking kit is for drawing layout on metal. New compound, termed "Brite-Line," is said to end use of chalk line, soapstone and center punch. Layouts can be drawn in 1/10 the usual time and cutting operation is quicker. Can be applied to metal regardless of surface condition, even over oil film, rust and scale, states the manufacturer. Won't rub off easily or wash off with water.

Compound retains brightness indefinitely but can be easily removed with wire brush or steel wool, it is reported. A polyethylene bottle with wheel-type applicator contains 33,000 linear in. of the quick-drying liquid "Brite-Line." Kit also includes special goggles with built-in light and a battery which gives up to 400 hrs of use. *Brite-Line Corp.*

Circle No. 19.

Automatic welder

MOTOR frame and core welder is for automatic electric motor production. Its production rate is 500 units per hour. Specialized welder can handle 56 and 66 frames with minimum of adjustment. Additional frame sizes can be accommodated by changing fixtures.

Precision location at 90-deg increments is assured by air-operated index pin. Welder has automatic electrical sequencing. Fabricated steel base supports all assemblies, except welding power source. Main indexing table, with 4 identical expanding mandrels and clamping fixtures, is located in center of base. Contact surfaces of clamps have replaceable jaws. Pedestal column head support has rigid beam for travel carriage and head. Air cylinder gives speed control of carriage, with range from 20-120 ipm. *Cayuga Machine & Fabricating Co., Inc.*

Circle No. 20.

Weld inspection

DYE method is for detecting surface flaws by visual inspection on nonporous materials. Two-step inspection process locates porosity and imperfect welds, cracks, fractures, cold shuts, tiny surface fissures on iron, steel, brass, aluminum, plastics and ceramics.

By spraying a thin coat of "Dyeline" dye and following with "Dyeline" detector, exact location, type and extent of defects will appear sharply and clearly against opaque background, states the manufacturer. A water wash removes dye immediately. Available in aerosol and bulk containers. *Zip Abrasive Co.*

Circle No. 21.

NOW 25,000 OVER ~~23,000~~ IN USE

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Portable SPOT WELDERS

- No other machine of its size produces such high welding current
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- Easily adjustable spring pressure
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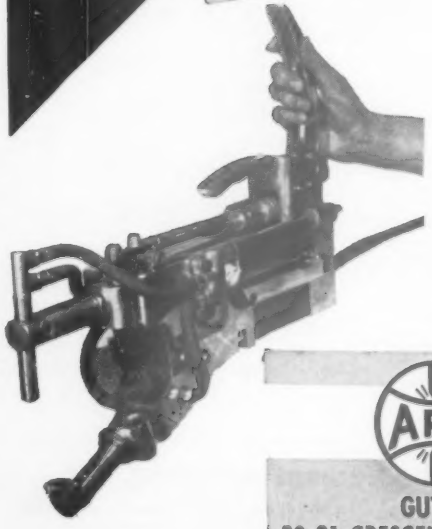
Air-Hydraulic and Air operated guns for high production also available.



ARO Model 192 with convenient lever to lower and raise bottom arm.

ARO SPOT WELDERS

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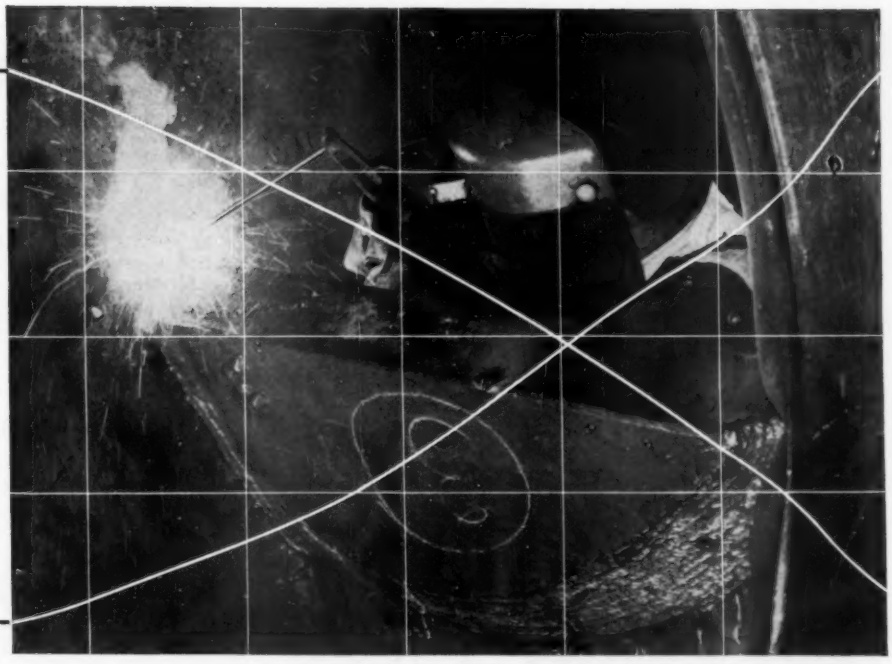

Equipment Service Life Up

NEW IRON POWDER HARD SURFACING ALLOYS
INCREASE DEPOSITION RATES — EXTEND PART LIFE

Longer wearing deposits and shorter down time increase efficiency of maintenance.

Every consumer of hard surfacing and build-up alloys desires an electrode having faster deposition rates and longer wearing deposits in order to shorten down time and increase overall operating efficiency. Here are three *new* iron powder hard surfacing electrodes designed to provide economies and quality of weld metal never before possible in hard surfacing operations.

Faster Deposition Rates

Because of the iron powder in the coating, higher welding currents may be used, thereby depositing more pounds of weld metal per hour. Greater deposition efficiencies are achieved because the iron powder serves as an additional source of weld metal.

Longer Wearing Deposits

Most hard facing alloys dilute heavily with the base metal on the first pass because of penetration. Although higher currents are used with these iron powder alloys, there is actually less penetration of the base metal because the added electrical energy is consumed in melting the iron powder rather than in disturbing the base metal. This provides a dense, porosity free higher alloy deposit ensuring longer part life.

Greater Ease of Application

Weldors will enjoy the smooth, easy to control arc characteristics of these new iron powder alloys. Spatter is practically eliminated and weldor fatigue is lessened to a point where you will see the gain in pounds of weld metal deposited.

Wear-Arc 3—I. P.

An iron powder low hydrogen build-up alloy for all weldable grades of carbon steel. This alloy has outstanding physical properties and provides an excellent base for hard surfacing deposits.

Wear-Arc 6—I. P.

An iron powder low hydrogen hard surfacing alloy for all position application. Designed for resistance to wear caused by severe abrasion in combination with heavy impact.

Wear-Arc 12—I. P.

An iron powder low hydrogen hard surfacing alloy for resisting wear caused by severe impact and abrasion.

Wear-Arc Iron Powder to be introduced and demonstrated live for first time at AWS Show . . . Booth 101—April 9, 10, 11, Convention Hall, Philadelphia, Penna. If you rebuild or hard surface worn equipment parts, Booth 101 will be your most profitable "spot" at the show.

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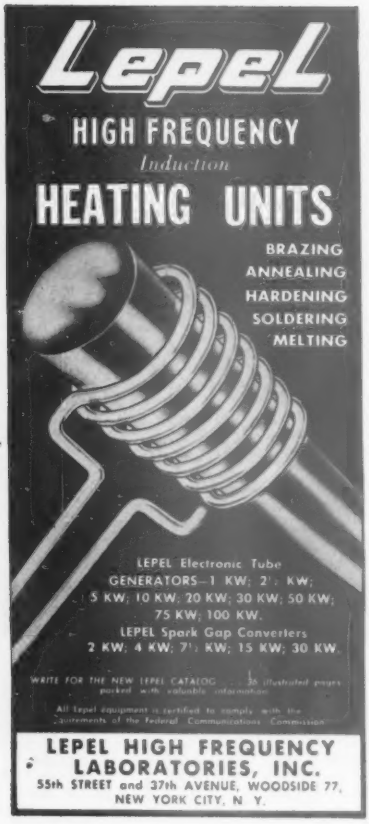
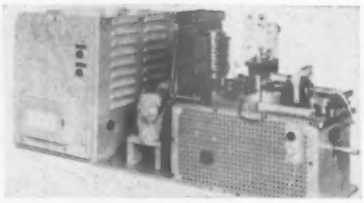




Wire cloth welder

AUTOMATIC machine is for forming and welding cylindrical screens of wire cloth. New welder can be used in aviation industry for making fuel line strainers and screens, and in electronics industry for forming and welding vacuum tube and microwave parts. Wire cloth is fed to machine from reel, cut to size, wrapped on arbor, welded, then ejected. Nominal production rate is 3,000 parts per hour, states manufacturer. *Federal Tool & Engineering Co.*

Circle No. 22.

Weld finishing

TOOL is for forming and finishing surfaces. Termed "Surform," it can be used on all materials up to hardness of mild steel, including copper, aluminum, lead and other metals, states manufacturer. It is especially suited for smoothing welds and finishing non-ferrous products.

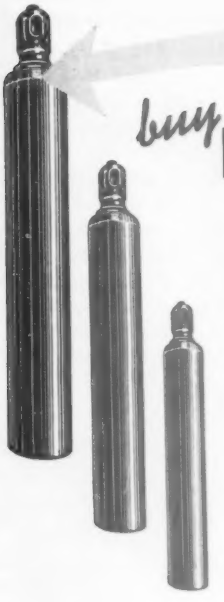
Two models are available, one shaped and used like a hand plane, the other like a rasp. Cutting component has more than 450 separate razor-sharp steel edges. Each cutting edge has a 35-deg angle and a semicircular throat through which chips and shavings pass. Depth of cut is controlled by sharp blade edges. Cuttings will not clog the blade. When cutting strip is worn, it is easily replaced. *Stanley Tools.*

Circle No. 23.

Index welder

AUTOMATED 8-station trunnion-type index arc welder has unique cam index mechanism and simple cam clamping mechanism. This specialized machine welds by the CO_2 shielded arc method. It can weld an outer cup and support bracket together to produce 433 automotive motor mount bracket assemblies per hour. By changing clamping fixture, machine can be adapted to variety of two-piece parts, requiring joining with longitudinal welds. Can also be adapted to submerged arc or argon shielded arc welding. *Expert Welding Machine Co.*

Circle No. 24.



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Mig welder

NEW semiautomatic welding unit is said to provide versatility and economy in Mig (metal inert-gas) welding. The unit is designed to operate with any constant-voltage d-c power source. It consists of a welding control and electrode-drive unit, and interconnecting gas, water and cable assemblies. Unit can be used with the "Powrmatic" constant-voltage welder. *Hobart Bros. Co.*

Circle No. 25.

Stainless electrodes

SERIES of coated stainless electrodes are said to produce high quality welds. The "Aerocor" is for welding aircraft and light gage stainless steel. The "Fabricor" is for stainless plate. Both are applied with d-c reverse polarity. Once arc is established, operator can use drag-type welding.

The "Aerocor" is available in four sizes from 1/16-⅛ in.; "Fabricor" in five sizes from 3/32-¼ in. Both types made in five standard grades for specific welding applications as follows: 308 for stainless types 301, 302, 304; 309 for type 309 and for joining 18/8 stainless to mild steel; 310 for type 310, stainless clad or stainless to mild steel; 316 for type 316; 347 for types 347, 321 and columbium or titanium stabilized 18/8. Also "Aerocor" is available in grade 349 for welding 19/9 DL and 19/9 DX.

All electrodes shipped in strong cartons. The "Aerocor" has dark blue coating, "Fabricor" a light blue coating. *Arcos Corp.*

Circle No. 26.

Thyratron

GAS and mercury-vapor filled thyratron is 30-amp type. Designated "NL-732," it is designed for motor speed control and a-c control applications. *National Electronics, Inc.*

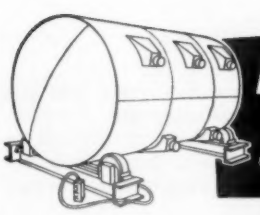
Circle No. 27.

Air line filter

AIR line filter-regulator-lubricator drains from the bottom without removing the bowl. Simply open the ¼ in. bottom bowl fitting for fast cleaning of the filter and lubricator. Unit is available in any combination or as individual units for ⅜, ½ or ¾ in. compressed air line.

Exterior surface of unit is in gray. Pressure regulator operates in an inverted position to permit a more compact, space-saving installation that can be designed into air-powered equipment. The regulator gage has an unbreakable face. *Keller Tool Division.*

Circle No. 28.



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cost no more than ordinary rolls!

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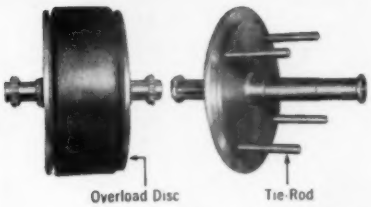

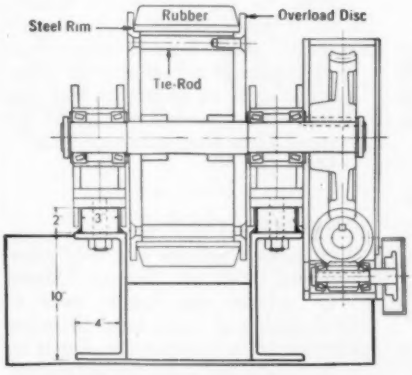

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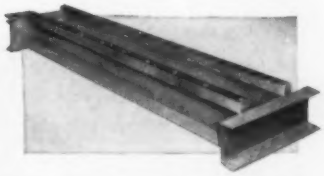

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Solvent

SOLVENT is non-flammable, will bite into and remove oil, grease, dirt without harming delicate metal parts of electrical insulation. Yet is safe to use in ordinary work areas with ordinary ventilation.

Three types of "Freon" cleaning compound available; is adaptable to vapor degreasing or cleaning by liquid immersion. Container sizes from 10-55 gal. *E. I. Du Pont de Nemours*
Circle No. 29.

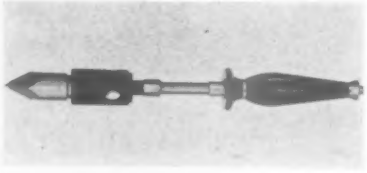
E6013 electrode

MANUAL arc welding electrode, recommended for general purpose applications, is classified E6013 type. Termed "W613B" it is heavily coated mild steel, designed to operate on either a-c or d-c, in all positions. Electrode is reported particularly suited for vertical fillets. *General Electric Co.*
Circle No. 30.

Surface grinder

WET surface grinder can hold tolerances of 0.002 in. Termed "Model 117," grinder can handle work to 42 in. high and 72 in. long. Grinding wheel is 16 in. in diameter. Feeds on both spindle and table are automatic.

Jig permits quick, easy set-up and rolls over work for grinding two or more sides. Head raises and lowers on hand-scraped ways driven by geared-head motor. Portable coolant tank is mounted on wheels. *Tillis Mfg.*
Circle No. 31.



Soldering iron

MEDIUM soldering iron "Prest-O-Lite 406" is an air-acetylene unit. It can handle all but heaviest soldering jobs in sheet metal, electrical, plumbing and plant maintenance shops. Iron heats to full working temperature in less than 2 minutes, states manufacturer.

Iron has form-fit handle and convenient thumb rest. Stainless steel stem and tube-within-a-tube construction retard heat conduction to handle. Needle valve at rear of handle makes possible precise flame adjustment, without overheating soldering copper. Available with interchangeable pointed or chisel-edge copper soldering heads. *Linde Air Products Co.*
Circle No. 32.

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Eyeshield

EYESHIELD has vinyl hood 11¾ in. long, with 78 staggered ventilating baffles. Termed "Airflow Chem," eyeshield has wrap-around molded stainless steel 20-mesh screen. This helps to allow air to flow freely, ending fogging. Offering maximum resistance to chemicals, shield is available in two colors—bright yellow frame for acid operation and crystal clear for more side vision. Shield weighs 3 oz, fits over eyeglasses. *United States Safety Service Co.*

Circle No. 33.

Weld sealer

SPOT weld elastic sealer compound is said to eliminate electrode failure caused by formation of copper oxide when tip comes in contact with ordinary compounds. Termed "Parweld," compound is said to provide watertight, corrosion-free joints.

Compound will adhere, it is claimed, without running or sagging on oiled sheets and will hold its form to temperatures of 350 deg for 45 minutes. It may be applied with conventional pressure compound equipment at 60 psi. It may also be extruded in beads as small as ⅛ in. *Parr Paint & Color Co.*

Circle No. 34.

Plastic jigs

POWDERED plastic composition, "Epocal," can be used as face coat for plaster casts used in fabrication of plastic jigs and fixtures or plastic faced metal forming dies. When mixed with water, material can be applied as splash coat in same manner as plaster or gypsum cements.

Sufficient time must be allowed to set, about 15 min., before laying on gypsum cement impregnated hemp fiber pads. Procedure for making a splash cast or master plaster pattern with "Epocal" is same as with conventional plaster methods. *Furane Plastics Inc.*

Circle No. 35.

Moly sheet

PURE molybdenum sheet is now available from warehouse stock. Available in seven thicknesses: 0.005, 0.007, 0.010, 0.012, 0.020, 0.025 in. *Fansteel Metallurgical Corp.*

Circle No. 36.

WOW!

You'll have to wait till April 9-10-11

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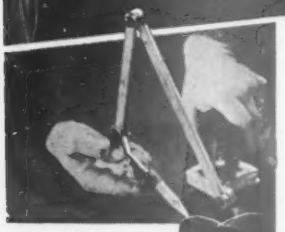
...for the Newest Developments in Automatic Welding



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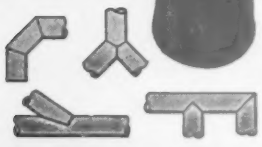

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Weld with HI-AMP

Blast cleaning

WHEEL is for centrifugally propelling abrasive in airless blast cleaning. Known as the "GM" unit, it can be used on equipment already installed as well as on machines being manufactured.

The wheel employs a simple spring arrangement for holding wheel blades in wheel. Locking device is not in abrasive blast stream. It can be inserted or removed with a screw driver. Blades used are of heat treated alloy steel. Available in 2½ in. wide by 19½ in. diameter size. *Wheelabrator Corp.*

Circle No. 37.

Wire connector

SCREW-ON type wire connector is for 600-volt general use, 1,000 volts when enclosed in fixtures. The Bakelite wire connector is a pressure cable connector for general use in branch circuit wiring. *Holub Industries, Inc.*

Circle No. 38.

Index welder

AUTOMATED index welder is claimed capable of accurately positioning and welding nuts or brackets to surfaces of production parts. Specialized welder features stop-and-start cam drive which controls index and weld sequences.

An air-powered unloader mechanism automatically removes finish-welded assemblies and deposits them on a conveyor. Motor-driven machine is electrically controlled and air-operated. Welder is 7-station rotary index type. *Expert Welding Machine*

Circle No. 39.

Dust collector

CABINET type "Series 80" cloth-filter dust collector has been redesigned to enlarge dust storage capacity. Three models, "81," "83" and "84" are affected. The change enlarges capacity of each collector from ¾ to 2 cu. ft. *Torit Mfg. Co.*

Circle No. 40.

Heat treating

LINE of furnaces is designed for pilot plant operation requiring testing and determining proper methods and processes for heat treating and melting of metals.

Six units are available: atmosphere box furnace for continuous operation at 2,600 F; box furnace with reactor control; 3 kw high-frequency induction furnace; horizontal tube furnace; vertical tube furnace; high temperature pot furnace for operation to 2,500 F. *Lindberg Engineering Co.*

Circle No. 41.

Dust collector

LINE of cyclone-type dust collectors feature connections to standard 55-gal drums. Designed for use where large volumes of dust exist, the "Series 55" feed directly into the drums. Exhausting capacities range from 1,000 to 1,100 cu ft of air per minute, at speeds in excess of a mile a minute.

Centrifugal force is used to precipitate all but the finest dust particles, up to 95%, with the other 5% being exhausted outside or trapped in an after-filter bag. Collectors stand on sturdy four-legged frame; have an airtight flexible shield that connects to top of drum. *Torit Mfg. Co.*

Circle No. 42.

Fume exhauster

MOVABLE on steel casters, the "W-200-50" stand type exhauster is designed to apply very high suction and then push welding fumes to nearest opening to external atmosphere. The "W-200-50" comprises gasoline or electrically-driven blowers capable of moving to 800 or more cu ft per minute (depending upon individual requirements) plus 8-ft stainless steel hose assembly, including arms and counterbalance for universal positioning. Available hose diameters are 4, 6 and 8 in. *Engwald Corp.*

Circle No. 43.

Atomic welder

ATOMIC hydrogen welder has been completely redesigned. The atomic hydrogen process is particularly useful in repair of dies, molds, machine tools, oil well bits.

Automatic hot start device gives current surge for positive starting, particularly at low current settings. Power factor capacitors help reduce line current requirements, states the manufacturer. Gas flow is controlled automatically. Gas consumption is from 30-90 cu/ft/hr during manual operation. Current range is 7-100 amp.

Atomic hydrogen process involves jet of hydrogen directed across arc formed between pair of tungsten electrodes. This generates atomic hydrogen which recombines at short distance from arc to form molecular hydrogen. Such action results in intense heat concentration in small area shielded by hydrogen atmosphere. Operator can control heat by varying distance between electrodes or distance of arc from work. Metal of approximately same analysis and strength as that being welded can be deposited, usually without flux. *General Electric Co.*

Circle No. 44.

THERMO Spiral

—the ONLY Tip Cleaners that GUARANTEE These OUTSTANDING Advantages

- Accumulated carbon and slag removed *without* scratching or enlarging orifice
- Left-hand spiral ridges clean and burnish old tips to *new* tip efficiency
- Have no breakage points caused by grooves running horizontally
- It's the ONLY Tip Cleaner with uniformly rounded cleaning ridges
- Locked in compact case to prevent damage. Standard set of 12 cleans 27 drill sizes
- Send for a FREE THERMO Spiral Tip Cleaner TODAY and prove to yourself *it can't be broken* in normal use.

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WORTHINGTON—MULLENBACH ARCTROL

For instant remote amperage control of arc welding machines. Only $63.00 (for most models)

Arctrol gives you remote heat control at the touch of your foot for faster, better welding. Eliminates cracks and porosity by permitting hot starts. Simplifies welding on thin gauge or where thicknesses vary. Speeds work and improves appearances by matching "heat" to the job.

The Arctrol is available through your local welding supply house or Worthington positioning equipment distributor, or send order direct to Worthington Corp., Plainfield, N.J. Specify make, model of welder. Free booklet available.

WORTHINGTON

X-RAY UNIT YOU, TOO, CAN AFFORD TO "WEAR"

Complete Baltospot X-ray unit—X-ray head, cables and control panel—costs less than $2900. Head weighs only 47 pounds, yet has rating of 140,000 volts and penetration up to 1½" of steel. Applicable to most X-ray inspection jobs, the Baltospot is the most powerful unit for its weight available. Dust-sealed, shock-proofed, moisture-proofed. USE PROVEN. Write for details.

OTHER UNITS rated 120, 160, 180, 200 and 260 KV for portable or stationary inspection of material from thin aluminum to 4" of steel. BG 180 for 360° radiography.

BALTEAU ELECTRIC CORPORATION
New and Meadow Streets, Stamford, Connecticut
Manufacturers of DIFFERENT X-Ray Equipment for Industry and Medicine

Alloys and Fluxes for joining and sealing

For Whatever Purpose You Fabricate

ALUMINUM . . .

Joining materials exactly suiting your needs are immediately available from ALL-STATE's largest selection of alloys and fluxes for welding, brazing and soldering ALUMINUM.
See Live Demonstrations Booth 442 AWS Show!

FREE DATA FOR WISEST SELECTION OF ALLOYS AND FLUXES TO WELD, BRAZE, SOLDER ALUMINUM
(prepared for standard 3-ring binder)

- Functions of alloying elements in aluminum
- Old and new type designations, including melt and flow temperatures and plastic range
- Composition of aluminum alloys
- Government specifications and aluminum types that meet them
- Where and how to use the different aluminum types
- Solders for aluminum to aluminum and aluminum to dissimilar metals . . . melt and flow temperatures, plastic range, strength, available forms and applicability to various production processes

ASK YOUR ALL-STATE DISTRIBUTOR FOR COPIES OF THE ALUMINUM CHART

ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

NEWS . . . . . *from page 6*

ing shields, dust collectors and welding equipment. More than 21,000 persons attended.

Among exhibitors were Aluminum Co. of America, Pipe Line Development Co., Insto-Gas Corp., National Cylinder Gas Co., United Specialties, Inc., Frommelt Industries and Harnischfeger Corp.

Wolfenden Welding wins Hobart award

For the second consecutive year (1955 and '56), Wolfenden Welding Supplies, Inc., Cleveland, has received the Volume Sweepstakes award from Hobart Bros. Co., Troy, Ohio.

Wolfenden Welding, which finished first in the competition among Hobart distributors, was cited for building sales of welding equipment, electrodes and accessories.

Eutectic opens Phoenix warehouse

Eutectic Welding Alloys Corp., Flushing, N. Y., recently opened a new warehouse and service center in Phoenix, Ariz. Located at 1402-1414 S. Seventh St., the center is under supervision of John Maffeo.

O.K.I. Welding celebrates founding

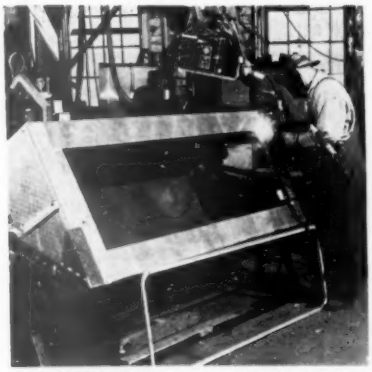
O.K.I. Welding Supply Co., Cincinnati, celebrates the 20th anniversary of its founding this month. The firm began as a partnership between Mr. and Mrs. E. C. Caluwaert. Since the death of Mrs. Caluwaert in September, 1955, E. C. Caluwaert has been sole owner. O.K.I. Welding Supply has some 20 dealers to help it service Ohio, Indiana and Kentucky.

M & T moves its Georgia facility

On March 1, the Atlanta, Ga., sales office of Metal & Thermit Corp., New York City, moved to new quarters at the Atlanta service warehouse, 565 Western Ave., N. W. Claude E. Davis, Jr., will continue in charge.

Midwest Airco in new offices

The midwestern regional staff (and railroad department) of Air Reduction Sales Co. moved March 4 to new quarters at 205 W. Monroe St., Chicago. The Chicago district sales office will move shortly to 3100 S. Homan Ave., thereby centralizing district operations.



CONVERSION of two freighters for passenger service included installation of aluminum shower enclosures. Weldor is shown welding the enclosures using the Mig process.

Freighter into liner for Pacific service

Following a Cinderella transformation, aided by welding, two former workhorse freighters will sail the Pacific Ocean as swift, passenger liners. Renamed the *Mariposa* and *Monterey*, the two 14-000-ton Oceanic Line ships were rebuilt from cargo hold to bridge.

Each 20-knot liner will sail from the West Coast to Australia and New Zealand, carrying 365 first-class passengers. Accommodations and facilities are modern, including all-aluminum shower enclosures. These were fabricated by the Mig (metal inert-gas) welding process. A large aluminum sheet was first formed into a distinctive enclosure shape. The pan and head strip were tack welded in place. Fabrication then was completed by using a rotary jig that eliminated positioning time during welding. After seams on one side were joined, the next side was positioned by revolving the unit in the jig.

Fabrication was done by Willamette Iron & Steel utilizing aluminum from Aluminum Co. of America.

Plate fabricators elect president

The Steel Plate Fabricators Association held its 24th annual meeting recently at the Palmer House, Chicago. Ernest E. Michaels, president of Chicago Bridge & Iron Co., was elected president.

Alpha Metals plans atomic soldering

Alpha Metals, Inc., will display a working model which shows the speed of automatic soldering at the forthcoming Radio Engineering Show in New York City, March 18-21.

a NEW product . . .
means NEW time saving . . .
important NEW production gains!

York's

SPAT-R-PRUF COMPOUND 106

Don't sputter about spatter . . .
JUST WIPE IT OFF!

Completely eliminates grinding after welding. Just one coat, and spatter can be wiped away with a dry cloth.

Available 1 or 5 gal. cans, 5 gal. drums

- NO STIRRING OR DILUTION
- NON-TOXIC
- NON-INFLAMMABLE
- NO ODOR
- HARMLESS TO SKIN
- PERFECT PAINT BASE
- HELPS PREVENT RUST
- NO WELD POROSITY

YORK ENGINEERING CO.
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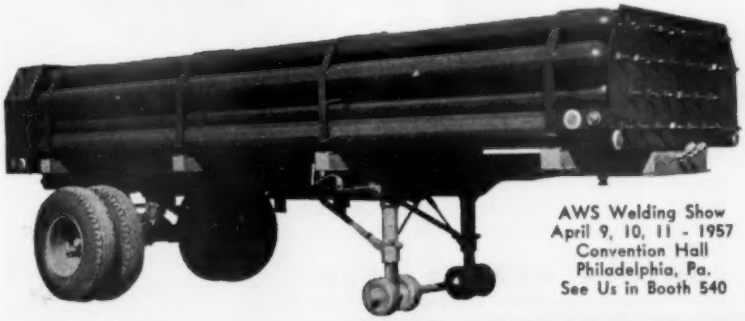
3 in 1 York's '77'
SPECIAL FLUX
FOR GENERAL BRAZING
FOR CAST IRON WELDING
FOR CAST IRON BRAZING

REDUCE CYLINDER HANDLING up to 50%

with* INDEPENDENT *Gas Supply TRAILERS

TRANSPORTING — Argon — Carbon Dioxide — Helium — Nitrogen — Oxygen — Boron Trifluroide — Hydrogen — Ethylene. Trailer capacities from 187,000 cu. in. to 750,000 cu. in. water capacity. Trailer tubes ICC3A-2400 Specifications with 2400 PSIG Working Pressure.



AWS Welding Show
April 9, 10, 11 - 1957
Convention Hall
Philadelphia, Pa.
See Us in Booth 540

Sizes and weights to meet all State requirements.

Can be mounted on bases for permanent storage.

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CONSULTING · RESEARCH · DESIGNING
O'FALLON 5, ILLINOIS

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 150 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

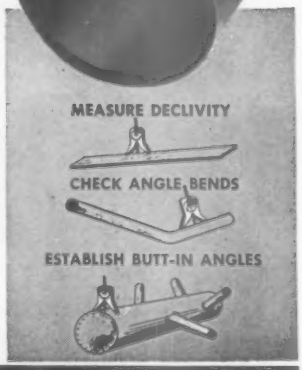
DIAL SET LEVEL _____

MARK A CENTER LINE *at any angle*

DIAL SET 45°

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

CONTOUR MARKER CORP.
1843 E. Compton Boulevard, Compton, California



Boyce CENTERING HEAD

New division for Westinghouse

Westinghouse Electric Corp., Pittsburgh, has formed a new X-ray and industrial electronics division. The action represents a merger of the X-ray division and the industrial electronics department, both located in Baltimore. W. J. Delaney, Jr., will head the new division, which will continue to make its headquarters in Baltimore.

Seattle expansion for Airco Pacific

An increase which will triple current capacity of the Seattle, Wash., air separation plant of Air Reduction Pacific Co., a division of Air Reduction Co., San Francisco, is planned for completion by late April.

With the addition of new facilities, the plant will produce liquid as well as gaseous oxygen and nitrogen. Gaseous argon also will be manufactured. The Seattle plant presently produces only gaseous oxygen and nitrogen.

Phoenix AWS aids students

The Phoenix chapter of the American Welding Society has a plan to encourage student interest in chapter meetings and other activities. An outstanding student is selected from welding schools and invited to attend monthly meetings as a guest. Results of the first such meeting held recently were gratifying.

Expansible van

—Courtesy U. S. Army

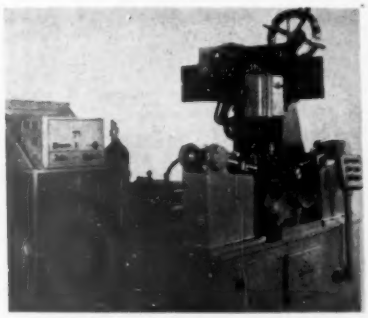
TRUCK-MOUNTED van which can be expanded to almost twice its 7-ft traveling width has been developed by Army engineers to provide mobile unit for photomapping. Welding was utilized in joining all structural steel members of the van. Each side wall is built on five outrigger beams extended by a cranking motion. When fully extended, hinged floor and roof sections are swung into position. Weight is kept to a minimum.

Norton to produce reactor elements

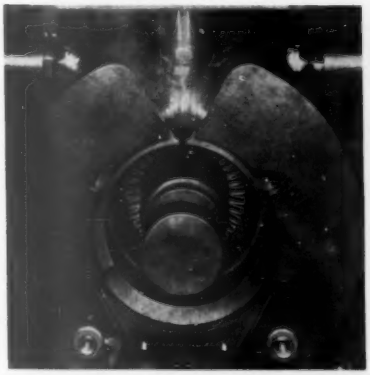
Norton Co., Worcester, Mass., has begun production of ceramic fuel elements for atomic reactors. These elements are molded of uranium oxide. Demand for materials to withstand increasingly higher temperatures has brought about use of ceramics.

Thor Power moves to Chicago offices

Thor Power Tool Co., Aurora, Ill., has moved its executive offices to the Prudential Bldg. in downtown Chicago. All executive officers in management and sales, previously housed at the Aurora plant, were involved in the transfer.



UNIQUE machine has reduced time required to form and weld stator core wrappers for electric motors. Designed by Standard-Modern Tool Co. Ltd., Toronto, Canada, mechanized Mig (metal inert-gas) welding is used in place of manual welding. Work area is at right; welding power rectifier, hydraulic system, control cabinet and welding head control are at left. In actual operation, the average . . .



. . . floor-to-floor time of forming and welding is 36 seconds. When weld is completed, the welding head returns to starting position and shuts off automatically. There is a 1/32-in. gap between ends of the wrapper to allow good penetration and a smooth weld. Equipment was supplied by Linde Air Products, New York City.

Tensile Testing

Fast!
Accurate!
Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5" to 9" in length. Various load gauges, grips, and other modifications are available.

Write for more information – give us your requirements.

DETROIT TESTING MACHINE COMPANY

9380 Grinnell Ave., Detroit 13, Mich.

assures maximum use . . .
at minimum costs!

SS HI-C
TRACTOR GROUSER BARS
High Carbon Steel
for
REBUILDING WORN TRACTOR GROUSERS

- *Attached quickly with any good grade of low hydrogen electrode.*
- *Easy to use with any manual or automatic electric welding method.*

Write for BROCHURE SS HI-C and Price List

STULZ-SICKLES CO.

SOIL PRODUCERS 929-39 PORT AVE. • ELIZABETH, N. J.

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Serving The Nation's Industry!
Like scales that are perfectly balanced, Coyne Cylinder Co. has timed its production and perfected its products to the exact needs of the nation's industry.
COYNE ACETYLENE CYLINDERS
Automatically Welded • New Coyne Monolithic Fillers with Increased Porosity for Greater Capacity and Faster Filling • Precision Produced and Tested to insure Peak Performance.
Write Dept. A-4 for Specification Sheet and Price List.
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CYLINDER COMPANY
TWO PLANTS TO SERVE YOU
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SAN FRANCISCO 24, CALIF.
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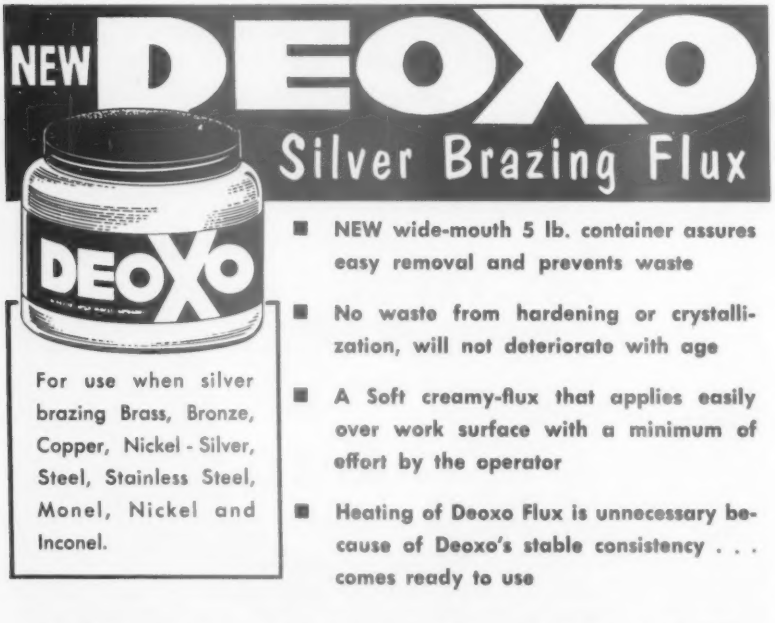
NEW DEOXO
Silver Brazing Flux
DEOXO
For use when silver brazing Brass, Bronze, Copper, Nickel - Silver, Steel, Stainless Steel, Monel, Nickel and Inconel.
■ NEW wide-mouth 5 lb. container assures easy removal and prevents waste
■ No waste from hardening or crystallization, will not deteriorate with age
■ A Soft creamy-flux that applies easily over work surface with a minimum of effort by the operator
■ Heating of Deoxo Flux is unnecessary because of Deoxo's stable consistency . . . comes ready to use
Available in ½ lb., 1 lb., 5 lb. Jars, 30 lb., and 65 lb. Containers
STEEL SALES CORPORATION
3348 S. PULASKI ROAD • CHICAGO 23, ILLINOIS
PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS
OFFICES: KANSAS CITY, GRAND RAPIDS
SS

COMING EVENTS

MARCH 11-15: Atomic Exposition & Nuclear Congress, Convention Hall, Philadelphia.

MARCH 11-15: Thirteenth Annual Conference & Exhibition, National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

MARCH 25-27: Silver Anniversary technical meeting, annual convention, American Society of Tool Engineers, Shamrock Hilton Hotel, Houston.

MARCH 25-29: Tenth Western Metal Congress & Exposition, American Society for Metals, Los Angeles. Congress at Ambassador Hotel; exposition in Pan-Pacific Auditorium.

APRIL 1-3: Fifty-seventh Annual Convention, International Acetylene Association, Hotel Nicollet, Minneapolis.

APRIL 8-12: Fifth Spring and Thirty-eighth Annual Meeting, American Welding Society, Hotel Sheraton, Philadelphia.

APRIL 9-11: Fifth Annual Welding Show, American Welding Society, Convention Hall, Philadelphia.

APRIL 29-MAY 3: Seventh National Materials Handling Exposition, Convention Hall, Philadelphia.

MAY 13-16: Thirteenth Annual Convention, National Welding Supply Association, Hotel Mayflower, Washington, D. C.

MAY 20-23: Design Engineering Show, Coliseum, New York City.

JUNE 11-13: Third Western Plant Maintenance & Engineering Show, Civic Auditorium, San Francisco.

OCT. 27-NOV. 1: Fourth Annual conference, Atomic Industrial Forum, Second Fall meeting, American Nuclear Society, and Trade Fair of Atomic Industry, Coliseum, New York City.

NOV. 4-8: Thirty-ninth National Metal Exposition & Congress, concurrently with Second World Metallurgical Congress, American Society for Metals, International Amphitheatre, Chicago.

Slide rule for rectifiers

A convenient slide rule calculator for computing rectifier and thyratron circuits is available from Electrons, Inc., 127 Sussex Ave., Newark, N. J. To obtain one, send 25 cents for handling and mailing to Electrons, Inc., at the above address.

Distributor appointments

Hobart Bros. Co., Troy, Ohio: Valley Welding Supply, Inc., Appleton, Wis.

Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio: Harris Equipment Co., Clearwater, Fla.; Charles Gunn, Portland, Ore.

North American Philips Co., Inc., Instruments Division, Mount Vernon, N. Y.: Braun Corp., Los Angeles.

TILLMAN
Gloves—Garments

WELDORS BUY FROM YOUR DEALER

ASK FOR OUR NEW CATALOG

BRAZILIAN DEERSKIN
THE "STAY SOFT" LEATHER
GLOVES AND MITTENS

TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.

For PROTECTION *you* NEED *with the* COMFORT *you* WANT

Flood Always
FINEST QUALITY
FAIRLY PRICED

FIBER GLASS HELMET

Strong, one-piece molded shell. Lightweight. Non-warping. Heat and moisture resistant. Easy to clean and sterilize. Comes with Flood No. 14 fiber or No. P-14 all plastic ratchet-type head gear.

FACE SHIELD

Excellent protection for spot welding, grinding, buffing, acid pouring. Fiber forehead shield. Contour headgear. Easy, window replacement without tools.

Manufacturers of Welding and Industrial Safety Equipment, including Flood's 1000-Hour Cover Lenses.
At Your Distributor or Write

FLOOD SAFETY PRODUCTS CO.
3035 West Lake Street, Chicago 12, Illinois

Jack E. Smith has been named vice president and manager of the newly-created research and development department of Smith Welding Equipment Corp., Minneapolis. He was formerly vice president in charge of production and engineering. *Percy E. Taylor,* formerly personnel manager, has been appointed manager of production and personnel.

Roy O. Schiebel has been elected second vice president, sales and marketing, by Magnaflux Corp., Chicago. He previously was sales manager, and is a member of the American Welding Society.

L. J. (Les) Blackford, vice-president and general manager of Johnson Welding Equipment Co., Chicago, was elected to the newly-created position of executive vice president at a recent meeting of the board of directors. At the same meeting, Mr. Blackford was also elected a member of the board.

Thomas A. Hickey has been appointed sales manager of K-G Equipment Co., a division of Air Products, Inc., Allentown, Pa. He had been regional manager.

Arthur Craig Wicker has joined the sales development department staff of Tube Turns, Louisville, Ky., a division of National Cylinder Gas Co.

Herbert G. Haussig has been appointed to the engineering staff of Johnston & Funk Titanium Corp., Wooster, Ohio.

Recently elected as directors of the Eutectic Welding Alloys Corp., Flushing, N. Y., were *Fred F. Roehll,* vice president and national sales manager and *Joseph F. Quaas,* recently elected vice president in charge of manufacturing and production. *Leon D. Richardson* was appointed assistant general sales manager.

For WELDING Savings—Install Dry® Rod Electrode Ovens

Avoid Scrap Losses, Reworks—Rejects

Your DRY-ROD Oven insures against defective welds caused by moisture. Protects low-hydrogen, austenitic, special alloy electrodes, as well as iron powder contact rods. Aids steadier welding, with less slowdown, reworks, and scrap. Repays its cost out of rod salvage alone. Costs less than 15c in 24 hours.

DRY-ROD is completely wired, ready to use. Available in 2 sizes for all industrial requirements. See your welding supply dealer.

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DIVISION OF

PHOENIX PRODUCTS CO.
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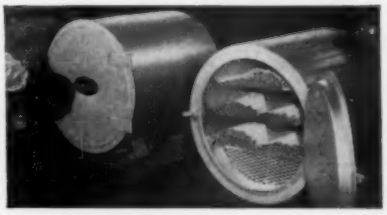


NO INJURIOUS FUMES . . .

"ANTI-BORAX"

No. 2 BRAZING FLUX

For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint—making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

ALSO

1—Cast Iron Welding Flux
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux for Cast Aluminum Welding
7—Steel Flux
8—Aluminum Flux for Sheet Aluminum
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys, Dow Metal, etc.
16—Silver Solder Paste Flux

FOR THE BEST JOB AT LEAST COST

Weldors can save more money and get a better job on production work, making special tools, and repair work with the right Anti-Borax product—**order by number.** Send for **free sample** and descriptive Circular.

ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

Weld-O-Vent

"World's Finest Exhaust Systems"

Welding Fume Exhausters

MANY EXCLUSIVE FEATURES

- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
- Blowers can be attached to units or mounted at remote points connecting with ductwork.
- Units can be connected in series.

High Velocity Hood Quickly Removes Smoke and Fumes.

Available in 9, 12, or 16 feet reach units.

Write For New Application DATA to Dept. WE-3

Engwald Corporation
357 LAFAYETTE AVE.
BROOKLYN 38, N Y.
ULster 7-7444

New appointments of the Manhattan Rubber & Packing Division, Raybestos-Manhattan, Inc., Passaic, N. J., were as follows: *R. F. Teeling*, eastern regional manager; *Stewart Monroe*, New York district manager; *J. T. M. Frey*, New Jersey district manager; *F. McBrearity*, Philadelphia district manager; *A. L. Hawk*, central regional manager; *A. N. Johnston, Jr.*, Pittsburgh district manager; *G. S. Himebaugh*, Chicago district manager; *E. T. Fair*, Denver district manager; *C. P. Shook, Jr.*, southern regional manager; *A. A. Ringland*, Birmingham district manager; *A. E. Jackson*, New Orleans district manager; *E. W. Nagel*, Dallas district manager; *R. C. Nielson*, Houston district manager; *S. V. V. Hoffman*, western regional manager, and *R. B. Park*, San Francisco district manager.

Glen C. Flumerfelt has been appointed Pacific Regional Manager, Welding Division, Metal & Thermit Corp., New York City. Before joining M & T early in 1955, Mr. Flumerfelt was associated with All-State Welding Alloys Co. He is a member of the American Welding Society, and will headquarter at M & T's south San Francisco branch.

James E. Borchert has been named to the newly created position of general purchasing agent of productive materials and operating supplies for the central purchasing operation of A. O. Smith Corp., Milwaukee. *J. J. Stahl* has been appointed assistant regional manager for the eastern district. *James Jones* was named manager of the Milwaukee Automotive & Railroad Products Division.

Lyman A. Bliss has been appointed president of Union Carbide Nuclear Co., a division of Union Carbide & Carbon Corp., New York City. He succeeds *Kenneth Rush*, a vice-president of Union Carbide.

Following appointments were made by Instruments Division, North American Philips Co., Inc., Mount Vernon, N. Y.: *Thomas P. Turnbull* to service manager of new service department; *Stephen L. Bender* and *Arthur L. Waldie* to sales staff; *Philip I. Wolf* to field sales manager; *Frank E. Farris* to manager, process control systems.

6863-CE

IMPROVE WELDING QUALITY WITH THE TONG TEST

AC-DC AMMETER

Now you can measure actual AC or DC welding currents without losing valuable production time. The Columbia TONG TEST is simply clamped around the electrode cable. Instantly you get an accurate ampere reading to control and maintain welding quality. Interchangeable ranges available up to 1000 amperes.

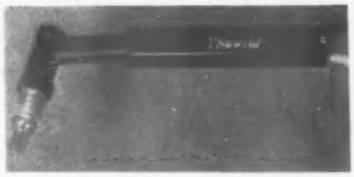
Eliminate defects . . . increase production . . . maintain valuable equipment with the low-cost Tong Test Ammeter. Write today for 8-page Catalog WE-400.

Only Tong Test Measures Both AC and DC

COLUMBIA

COLUMBIA ELECTRIC MFG. CO.
4551 Hamilton Avenue • Cleveland 14, Ohio

TIG WELDING
Made Easy With
"Visuweld" Torches



VISUWELD torches improve and simplify tig welding by giving faster and better welds with less effort and minimum torch maintenance.

- The lightest and smallest 350 amp TIG welding torch with super maneuverability.
- Only TIG torch made with standard size transparent cup that guarantees absolute welding visibility.
- NO SPARE PARTS NECESSARY. No gaskets or parts to 'screw together'.
- VISUWELD contained unit torch head guarantees no water or gas leakage, and the coolest TIG welding torch ever designed.

Perfect welds at welding ranges from 3 to 350 Amps eliminates the need for 'standby' torches. VISUWELD torches are 3 torches in 1.

TEC TORCH CO., Inc.
300 Paterson Ave. Carlstadt, N. J.

Faster Production, Less Spoilage

An amazing new insulation coating that painted on, dries overnight to protect electrodes, horns, holders, seam welding wheels and arms . . . "No-Short"

A firm, chip-proof, abrasion-resisting dielectric coating that prevents "shorts". Saves on expensive work-stoppage, damaged rejects, pitted electrodes and holders, blown fuses, and loose welds. Resistance welding equipment coated with "No-Short" speeds production.

"No-Short" is a product of

LOVELL CHEMICAL CO.

Watertown 72, Massachusetts

Choose Huntsman angle-shape for

- reduced glare from behind
- better top-of-head protection
- easy fit in your toolbox
- scientific upward ventilation
- longer helmet life

Specify the complete line of quality-built, guaranteed products

HUNTSMAN "face savers"

WELDING HELMETS, FACE SHIELDS & ACCESSORIES

Kedman Co., 233 So. 5th West, Salt Lake City 1, Utah

P. M. (Pete) Hall recently resigned from government service. He continues as a consultant to the Business & Defense Service Administration, Department of Commerce, Washington, D. C. Mr. Hall has served the federal government during three periods of emergency—World Wars I and II and the Korean war.

John Strother was recently appointed to the sales organization of Alloy Rods Co., York, Pa. He will work in the southeastern-states area.

James W. Dunham was elected president of the Compressed Gas Association, Inc., at its 44th annual meeting. Mr. Dunham, a vice president of National Cylinder Gas Co., Chicago, succeeds *Merle L. Griffin* of Shell Chemical Co. Mr. Dunham is a past president of the International Acetylene Association. Other CGA officers elected were *A. R. Olson*, first vice president; *Claude E. Monlux*, second vice president; *F. R. Fetherston*, re-elected secretary-treasurer.

Dunham

William E. Clark, Jr., has been promoted to sales office supervisor for building products by American Welding & Mfg. Co., Warren and Niles, Ohio. *Stewart T. Hunter* succeeds him as sales promotion and advertising administrator in Warren. *John K. Griffin* recently joined the firm as assistant director of industrial relations.

John W. Mason, senior advertising specialist for General Electric's Metallurgical Products Dept., Detroit, has been appointed manager of advertising and sales promotion.

John R. Gorey has been appointed sales promotion manager by Lindberg Engineering Co., Chicago. He will continue as public relations director.

Died . . .

Jean M. Ragle, 59, president of J. M. Ragle Industries, Kansas City, Mo., died Feb. 10 after a brief illness. Mr. Ragle, an old-timer in the welding industry, began his career with Air Reduction Sales Co. in the Kansas City area. In 1944, he organized his own company to manufacture welding accessories. Surviving are his widow, Leolyn, a daughter and several grandchildren.

DVS-Fachschau
SCHWEISSEN UND SCHNEIDEN
Werk- und Verkaufsausstellung der Schweißtechnik
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51. MIG CUTTING—Air Reduction Sales Co. Mig (metal inert-gas) cutting, manual and machine, is described and illustrated in 24-page catalog (form ADE 880).

52. WELDING TIPS—Suffolk Iron Foundry (1920) Ltd. Attractive illustrated welding quarterly *Sif-Tips* (No. 95) contains tips on welding cast aluminum and nonferrous alloys.

53. COPPER—The Beryllium Corp. Amply illustrated, technical bulletins Nos. 36 and 37 discuss advantages of copper parts when used, for example, in electric range switches and core box inserts.

54. MAGNETIC CLAMP—Buck Mfg. Co. Bulletin 3867 describes and illustrates "Bux" magnetic plate clamp for welding, as well as drill vises and drill presses.

55. GRINDING WHEEL—Simonds Abrasive Co. Illustrated color bulletin (form ESA-62) describes abrasive snagging wheels for steel mills and foundries featuring the new "IL" bond which acts as an internal lubricant.

56. WELDERS—Raytheon Mfg. Co. 4-page booklet treats types of welders available, including welders of special design. Also included are transformers, voltage stabilizers, power-supply equipment.

57. WELDOR'S GOGGLE—H. L. Bouton Co. The "Softsides" goggle, said to provide full vision with comfort, is subject of illustrated sheet.

58. POWER TUBES—General Electric Co. Interchangeability list covers such power tubes as thyratrons, rectifiers, diodes.

59. CLAD STEELS—Lukens Steel Co. Clad steels, claimed ideal for welded fabrication, are amply discussed in illustrated 4-page folder (No. 771).

60. WELDOR'S HAT, MASKS—Mine Safety Appliances Co. Bulletin 0601-2 treats, with illustrations, glass fiber safety hat. Four-page folder discusses respirators and masks, including schematic diagram of functioning.

61. METALLIZING—Metallizing Co. of America. Metallizing with the "Mogulectric" variable-drive gun is treated in 4-page brochure.

62. NICKEL GUIDE—The International Nickel Co., Inc. Easy-to-read 15-page booklet (2473 2-B) is helpful guide to standard nickel alloys, including those recommended for welding use.

63. THERMOCOUPLES—The Bristol Co. Handy bulletin P1238 is designed as buyers' guide and users' manual for thermocouples and pyrometer accessories.

64. GRINDING WHEEL—American Emery Wheel Works. Depressed-center wheels, high-speed portable wheels and cut-off wheels are subject of 4-page folder (HCG 1346 9-56).

65. LENS CLEANING—Carhoff Co. Folder describes "No-Fog" lens cleaning tissues.

66. SEQUENCE VALVES—Ross Operating Valve Co. Bulletin 321, spiral-bound, covers inline retrold valve for automatic pneumatic sequence.

67. TIMER—General Control Co. Bulletin ET-600 describes type "ET" electronic timer which can control operations between 60 milliseconds and 60 seconds.

68. SPEED MEASUREMENT—Herman H. Sticht Co., Inc. Bulletin 770 illustrates description of "Standco" vibrating reed tachometers.

69. HELMETS, GOGGLES—Sellstrom Mfg. Co. 53-page catalog describes welder's goggles, helmets, lenses and plates, safety shields, respirators.

70. ARC WELDING—Air Reduction Sales Co. Illustrated 44-page catalog (ADC 708C) discusses arc welders and accessories, selenium rectifiers, engine-driven welders, helmets, remote controls, hand trucks.

71. POSITIONERS—Worthington Corp. Bulletin No. R-1700-S18 P is specification sheet on model "5P" welding positioner; Bulletin No. R-1700-S19 P covers head- and tailstocks.

72. HEAT TREATING—Surface Combustion Corp. Heat treating, including brazing, is covered in illustrated folders SC-176, SC-148 and SC-175.

73. WELDING REPAIR—Metallizing Co. of America. 4-page illustrated folder outlines casting reclamation and other repairs made with "Dot-Weld' process.

74. INDUSTRIAL X-RAY—Machlett Laboratories, Inc. Industrial "Thermax" X-ray tube is subject of 7-page bulletin (ST-186). The "OEG-50" beryllium window X-ray tube is discussed in folder (ST-718).

75. SOLDER FLUX—Farrelloy Co. Two illustrated sheets describes solder flux, paste solder, welding and brazing fluxes.

76. ALUMINUM PIPE—Whitehead Metal Products Co., Inc. Illustrated folder lists available types of aluminum tube, pipe.

77. WELDING ROD, FLUX—Aladdin Rod & Flux Co. Three illustrated catalog sheets cover zinc alloy welding rods, aluminum and soft solder, welding and brazing flux, soap-stone pencil.

78. ZIRCONIUM—Carborundum Metals Co. New bi-monthly brochure "More Zr Facts" (Vol. 1, No. 1) discusses zirconium production.

79. DO-IT-YOURSELF—The Lincoln Electric Co. Illustrated leaflet shows how to build your own engine-driven welder (AV-109).

80. TRUCKS—Simmons Supply Co. Subject of illustrated sheet is 3 models of oxyacetylene and oxygen trucks.

81. TEMPERATURE—Tempil Corp. Plastic-laminated wall chart "Basic Guide to Ferrous Metallurgy" is valuable reference source.

82. CHAIN LINKS—Columbus McKinnon Chain Corp. The "CM Hammerlok" steel coupling link which permits users to make individual assemblies is subject of bulletin 120.

83. GROUND CLAMP—Mueller Electric Co. 8-page catalog 180 discusses clips and insulators, including welding ground clamp, clips for cables, general-purpose ground clamp.

84. MIG WELDING—Air Reduction Sales Co. 2-color catalog 2350 describes and illustrates Mig (metal inert-gas) welding equipment, including "AMH-B" welding head, accessories.

85. BUFFING, POLISHING—Hanson-Van Winkle-Munning Co. Bulletin No. Co-103 illustrates and describes buffing and polishing compounds.

86. RUBBER LINING—Manhattan Rubber Div. Catalog No. 7115 covers corrosion, abrasion, contamination-resistant rubber lining for tanks, pipes, valves.

87. HARDFACING—Western Carbide Corp. Hardfacing spray powders ("Hi-C") are subject of illustrated sheet.

88. GOGGLES, EYESHIELDS — Jackson Products, Inc. Handy, pocket-size, 20-page catalog (3040) illustrates available models of helmets, safety hats, goggles, eyeshields.

89. BRAZING—Eutectic Welding Alloys Corp. "Production Brazing" is 9-page, fully-illustrated reprint (TIS 2635) of paper originally given in Spain.

90. WELDING BOOTH — Engwald Corp. 4-page illustrated leaflet discusses welding booths and accessories.

91. FLEXIBLE HOSE—Titeflex Inc. 28-page illustrated catalog covers flexible metal hose, couplings, tubing, etc.

92. FIRE EXTINGUISHER—Walter Kidde & Co., Inc. 16-page color catalog (I-158-R1) covers pressure-operated carbon-dioxide fire extinguishing systems.

93. WELDING, BRAZING — All-State Welding Alloys Co., Inc. Pocket-size booklet is buyers' guide to alloys and fluxes for welding, brazing, soldering, cutting, tinning.

94. TUBE NOTCHER—Wallace Supplies Mfg. Co. 24-page hard-cover book shows, in large, clear illustrations, how to notch tube or pipe and obtain weldable joints.

95. RECLAIM FLUX—American Pulverizer Co. Bulletin 157 describes crushers used to reclaim fused welding flux for reuse. Typical installations are illustrated.

96. WELDING CHAMBERS — Leader Welding & Mfg. Co. 20-page technical bulletin describes typical controlled-atmosphere vacuum chambers for welding.

97. ELECTRODE DATA—National Cylinder Gas Co. 24-page electrode data book (NH-504) presents in easy-to-use form: information on AWS-ASTM arc welding electrode specifications; how to estimate electrode consumption; summary of welding symbols; factors in proper electrode selection.

98. PLASTIC WELDING—American Agile Corp. Catalog sheet illustrates the "Mark III" thermoplastic spray and fluidizing unit; a smaller combination unit designed for laboratory use, and a do-it-yourself plastic welding kit.

99. POWER CABLE—Airtron, Inc. Illustrated sheet No. 5100 describes quick-disconnect power-cable assembly for use in the welding industry. Several types are available.

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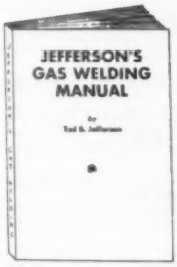

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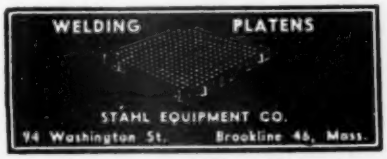

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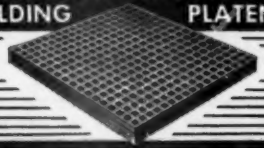

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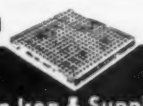

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Literature offered in ads

125. Air Reduction Sales Co.—Catalog 1318-WE, "Airco Electrode Guide," on selecting the right electrode for your specific job.

126. Air Reduction Sales Co.—Illustrated Catalog 9-13 includes specifications, applications and ordering data on complete line of "Airco" welding accessories.

127. Air Reduction Sales Co.—Complete information on "Aircomatic" wire spools, cores, coils and wirepacks.

128. Allen Co., Inc., L. B.—Information on fluxes for soldering, brazing and welding.

129. Alloy Rods Co.—Details on how new iron-powder hardsurfacing alloys increase deposition rates and give longer wearing deposits with greater ease of application.

130. All-State Welding Alloys Co., Inc. —Data for selection of alloys and fluxes to weld, braze and solder aluminum and "Aluminum Chart."

131. Aluminum Co. of America—Informative books and films on how easy it is to weld, braze or solder aluminum.

132. American Brass Co.—Information on special problems and Publication B-13 gives complete description on "Anaconda" welding rods and discusses procedures for welding with copper alloys in a wide variety of applications.

133. American Platinum Works, Inc.—Fluxing manual, "A Complete Guide To Selective Fluxing For Low Temperature Silver Brazing" provides data on how to make the correct selection of flux.

134. Ampco Metal, Inc.—Data on welding dissimilar metals with "Ampco-Trode 10" electrodes.

135. Anti-Borax Compound Co.—Descriptive circular and sample of solder and brazing compounds and fluxes.

136. Aronson Machine Co.—Detailed engineering data on positioners, turning rolls, turntables and magnetic welding clamps.

137. Aro Spot Welder Div.—Illustrated literature on portable spot welders.

138. Atlas Welding Accessories, Inc.—Details on 30 models of "Tomahawks" for weld cleaning jobs.

139. Balteau Electric Corp.—Details on "Baltospot" X-ray unit—X-ray head, cables and control panel.

140. Belden Mfg. Co.—Information on welding wire.

141. Burdett Oxygen Co.—Literature on "Burdox Statosec" shape-cutting machine.

142. Cayuga Machine & Fabricating Co. —Information on automatic welding equipment and newest developments in automatic welding.

143. Chicago Eye Shield Co.—Complete catalog on welding helmets, face shields and other safety products and name of nearest "Cesco" distributor.

144. Columbia Electric Mfg. Co.—Catalog WE-400 on the "Tong Test" a-c/d-c ammeter.

145. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

146. Contour Marker Corp.—Details on establishing and marking a point at any angle.

215. Coyne Cylinder Co.—Specification sheet and price list on aceylene cylinders.

147. Crescent Co.. Inc.—Information on "Dynapower" welding cable.

148. Crucible Steel of America—Details on automatic welding wire for cleaner, faster, sounder welds.

149. Detroit Testing Machine Co..—Information on fast, accurate, easy tensile testing.

150. Drawalloy Corp.—Literature and application manual on semi-automatic "Wear-O-Matic" precision drawn hardsurfacing wires.

151. Engwald Corp.—Application data on welding-fume exhausters.

152. Eutectic Welding Alloys Corp.—Information on a-c/d-c "EutecTrode 680," "EutecTrode 10" with "Frigid Arc" flux coating, aluminum "EutecTrode 2101" with extruded flux coating and all-position "EutecTrode 66" for low and medium carbon steels.

153. Eutectic Welding Alloys Corp.—Send for 170-page pocket, "Welding Data Book."

154. Federal Machine & Welder Co.—Data on three-phase frequency converter spot welder designed for joining tail section of new commercial jet airliner.

155. Fibre-Metal Products Co.—Catalog 24 and Bulletin 39 presenting safety equipment for working protection.

156. Flood Safety Products Co.—Data on strong, one-piece, non-warping, heat and moisture resistant No. 14 fiber glass and No. p.14 all plastic ratchet-type helmets.

157. General Cable Corp.—Details on how aluminum welding cable makes your job easier.

158. General Electric Co.—Demonstration and information on "Fillerarc" process.

159. Goldsmith Bros. Smelting & Refining Co.—"GB Data Book" gives complete information on low-temperature silver-brazing.

160. Harnischfeger Corp.—Booklet, "What You Should Know About Welding Positioners."

161. Harnischfeger Corp.—Data on "P&H" welding positioners.

162. Harrisburg Steel Co.—Prices and complete information on high-pressure, seamless gas steel cylinders.

163. Harris Calorific Co.—Information on economy and efficiency in gas welding and cutting apparatus.

164. Hobart Bros. Co.—Information on a-c/d-c combination, electric motor drive, gas engine drive and d-c rectifier welders.

165. Hobart Bros. Co.—Details on a-c transformer and iron-powder electrodes.

166. Hobart Bros. Co.—Data on fully automatic submerged arc welding with "Simplified" controls; "Handomatic" for semi-automatic submerged arc welding; "Tractor Type" for submerged arc welding and "Powromatic" for automatic arc welding.

167. Independent Engineering Co., Inc. —Details on how to reduce cylinder handling with gas supply trailers.

168. International Nickel Co., Inc.—Illustrated booklet, "A Handy Guide to Welding Cast Irons," contains technical welding tips.

(Continued on page 106)

AD INDEX

Air Reduction Sales Co. 20, 76, 79
Allen Co., Inc., L. B. 101
Alloy Rods Company 87
All-State Welding Alloys Co., Inc. 94
Aluminum Co. of America 62-63
American Brass Company ..... Outside Back Cover
American Chain & Cable Co., Page Steel & Wire Div. 14-15
American Platinum Works, Inc. 22
Ampco Metal, Inc. 57
Anti-Borax Compound Co. 100
Aronson Machine Co. 89
Aro Spot Welder Div., Guthery Machine Tool Corp. 86
Atlas Welding Accessories, Inc. 12

Balteau Electric Corp. 94
Belden Manufacturing Co. ..... Inside Front Cover
Burdett Oxygen Co. 61

Cayuga Machine & Fabricating Co. 91
Chicago Eye Shield Co. 2
Columbia Electric Mfg. Co. 100
Contour Marker Corp. 92, 96
Coyne Cylinder Co. 98
Crescent Co., Inc., Carol Cable Div. 18
Crucible Steel Co. of America 45

Detroit Testing Machine Co. 97
Drawalloy Corporation 81

Engwald Corporation 100
Eutectic Welding Alloys Corp. 83

Federal Machine & Welder Co. 77
Fibre-Metal Products Co. 59
Flood Safety Products Co. 99

General Cable Corp. 67
General Electric Co. 74-75
Goldsmith Bros. Smelting & Refining Co. 84
Guthery Machine Tool Corp., Aro Spot Welder Div. 86

Harnischfeger Corp. 13, 47
Harrisburg Steel Co. 88
Harris Calorific Co. 24
Hobart Bros. Co. 1

Independent Engineering Co., Inc. 95
International Nickel Co., Inc. 9

Jackson Products, Div. of Air Reduction Sales Co. 4

K-G Equipment Co., Inc. 85
Kaiser Aluminum & Chemical Corp. 10-11
Kedman Company 101

Lenco, Inc. 92
Lepel High Frequency Labs., Inc. 88
Lincoln Electric Co. 26
Linde Air Products Co., Div. of Union Carbide & Carbon Co. 16, 71
Lovell Chemical Co. 101

Magnaflux Corporation 53
Merrill Brothers 71
Metal & Thermit Corp. 21
Miller Electric Mfg. Co. ..... Front Cover, 8
Mitchell Radiation Products Corp. 90

National Carbide Co. 96
National Cylinder Gas Co. 64-65
National Welding Equipment Co. 7
Nickelson Tool & Die Co., Inc. 71
Norris-Thermador Corp. 73

Page Steel & Wire Div., American Chain & Cable Co. 14-15
Phoenix Products Co. 99
Picker X-Ray Corporation 69

Schweissen & Schneiden 101
Sight Feed Generator Co. 82
Smith Corp., A. O. 54-55
Smith Welding Equipment Corp. 80
Square D Company 19
Steel Sales Corp. 98
Stulz-Sickles Co. 97
Sylvania Electric Products Inc., ... Inside Back Cover

Tec Torch Co., Inc. 100
Tempil Corporation 90
Thermacote Company 93
Tillman & Co., John 99

Union Carbide & Carbon Corp., Linde Air Products Co. 16, 71

Vickers Electric Div., Vickers, Inc. 23
Victor Equipment Co. 28

Worthington Corporation 49, 93

York Engineering Co. 95

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51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
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176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
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ad literature

(Continued from page 104)

169. Jackson Products—Details on comfortable and convenient "Musketeer" headgear assembly with choice of four eye and face shields.

170. K-G Equipment Co., Inc.—Details on how you can save money with the "Series 1200" single-stage regulator.

171. Kaiser Aluminum & Chemical Corp.—Informative booklet, "New Advantages in Arc Welding Cable with Aluminum Welding Cable."

172. Kedman Co.—Information on welding helmets, face shields and accessories.

173. Lenco, Inc.—Information on "Hi-Amp" electrode holders.

174. Lepel High Frequency Laboratories, Inc.—Catalog contains information on high-frequency induction heating units for brazing, annealing, hardening, soldering and melting.

175. Lincoln Electric Co.—Specifications on "Shield-Arc" welders.

176. Lincoln Electric Co.—Bulletin SB-1356 on diesel driven welders and Bulletin SB-1337 on gasoline driven models.

177. Linde Air Products Co.—Booklet on how "X-7" anti-spatter compound saves time and cuts costs.

178. Linde Air Products Co.—Details on "Purox W-200" welding blowpipe.

179. Lovell Chemical Co.—Details on "No-Short" abrasion-resisting dielectric coating that prevents "shorts" and protects electrodes, horns, holders, seam welding sheets and arms.

180. Magnaflux Corp.—Information on testing systems that can save money and improve the quantity and quality of your welding.

181. Merrill Bros.—Information on lifting clamps, twin and drum lifters, drum tilter and other material handling devices.

182. Metal & Thermit Corp.—Folder on "M&T Croloy" electrodes and how to use them.

183. Metal & Thermit Corp.—Data on new rectifier-type "Controlled Arc Power Supply" machine for constant voltage welding.

184. Miller Electric Mfg. Co., Inc.—Details on "SRTA" a-c/d-c welder for both inert gas and metallic arc welding.

185. Miller Electric Mfg. Co., Inc.—Complete specifications and data on new "Multi-Arc" a-c/d-c combination welder.

186. Mitchell Radiation Products Corp.—Details on portable industrial X-ray equipment.

187. National Carbide Co.—Write for name and address of nearest supplier.

188. National Cylinder Gas Co.—Complete information on types "R" and "JR" cutting machines and "Cut-O-Matic" portable cutting machine for all flame-cutting jobs.

189. National Welding Equipment Co.—Brochure, "flame cutting—here's how it works."

190. Nickelson Tool & Die Co., Inc.—Descriptive folder on "Woerner" tubular profile cutter.

191. Norris-Thermador Corp.—Specifications and sizes of acetylene cylinders.

192. Page Steel & Wire Div.—Folder DH-1277 on gas welding rods.

193. Page Steel & Wire Div.—Folder DH-402A on submerged-arc and inert-gas welding wire.

194. Phoenix Products Co.—Information on "Dry-Rod" electrode ovens.

195. Picker X-Ray Corp.—Outline your problem sending typical samples of inspection problems for possible solution through gamma or X-ray radiography.

196. Schweissen & Schneiden—Details on welding engineering exhibition in Europe.

197. Sight Feed Generator Co.—Details on "Rexarc" submerged-arc machine for hardfacing.

198. Smith Corp., A. O.—Information on welder-proved electrodes, machines and accessories.

199. Smith Welding Equipment Corp.—Details on "Silver Star" oxy-acetylene cutting torches.

200. Square D Co.—Bulletin 8991 on industrial "Plug-In" units, timers and relays for better welding production.

201. Steel Sales Corp.—Information on new "Deoxo" flux for silver-brazing brass, bronze, copper, nickel-silver, steel, stainless steel, monel, nickel and inconel.

202. Stulz-Sickles Co.—Name of nearest distributor and brochure and price list on "SS HI-C" high-carbon steel tractor grouser bars for rebuilding worn tractor grousers.

203. Sylvania Electric Products, Inc.—Information on color-coded tungsten electrodes.

204. Tee Torch Co., Inc.—Information on "Visuweld" torches for Tig welding.

205. Tempil Corp.—Sample pellets and booklet, "How Temperatures are Measured."

206. Thermacote Co.—Details on "Thermo" spiral tip cleaners and free sample.

207. Tillman & Co., John—Catalog on weldors's gloves and garments.

208. Vickers Electric Div.—Information on "Controlarc" d-c welder that gives remote control of current and type of arc.

209. Victor Equipment Co.—Literature and demonstration on combination on welding and cutting units.

212. Worthington Corp.—Booklet on "Mullenbach Arctrol" for instant remote amperage control of arc-welding machines.

213. Worthington Corp.—Useful details on positioners, automatic welding head manipulators, turning rolls, head and tailstock.

214. York Engineering Co.—Details on how "Spat-R-Pruf Compound 106" eliminates grinding after welding.

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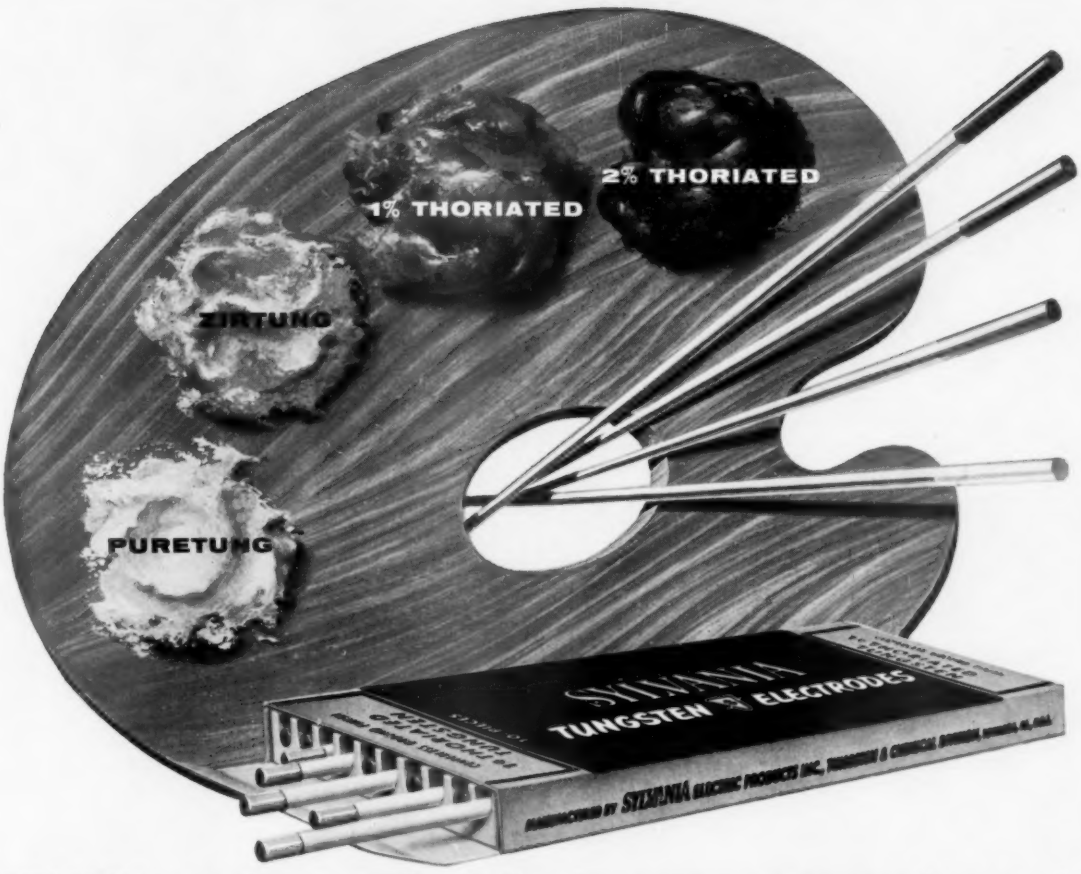

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SYLVANIA TUNGSTEN ELECTRODES

Now all Sylvania Tungsten Electrodes are color coded . . . for greater safety . . . greater economy and convenience. You can tell the type of rod merely by glancing at the exposed end.

Used lengths of rods, regardless of size, no longer need to be scrapped for lack of identification. And no longer do you risk ruining a costly job because of choosing the wrong electrode. When you use Sylvania color coded electrodes, you know for certain which rod type you have in your clamp.

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Supplied with chemically cleaned or centerless ground finish, Sylvania Tungsten Electrodes are available in handy packages of ten color coded rods. For further information see your welding supplies distributor or write to:

SYLVANIA ELECTRIC PRODUCTS INC.
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WELDING ROD CLINIC

J. Imperati and R. F. Pulver, Welding Engineers
The American Brass Company, Waterbury, Conn.

Braze Welding is virtually foolproof for cast iron repairs

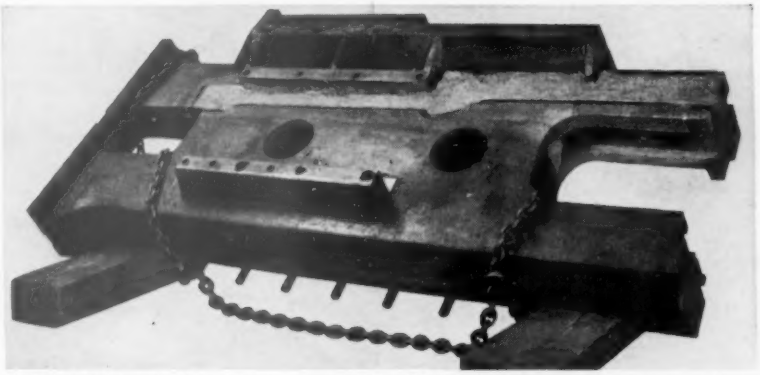
Low temperatures used give strong and enduring welds

The major obstacles to successful repair welding of cast iron are the low strength and poor ductility of cast iron weld metal, and the embrittlement and hardening produced by rapid cooling from welding temperatures.

Oxyacetylene fusion welds with cast iron rods have such very low strength and ductility that they often crack under the stresses imposed during welding and cooling. If they survive these hazards, they sometimes fail when subjected to the service stresses that caused the original failures.

On the other hand, severe embrittlement and hardening of weld and adjacent base metal are easily developed in arc welding because of the steep temperature gradients from weld to base metal. Here also, failure can occur during welding and cooling, or later in service. Usually the weld area is extremely hard and not machinable. It is often necessary to resort to extensive preheating, peening, post-heating, and annealing to avoid these twin evils.

Oxyacetylene braze welding is an excellent solution to the problem for two reasons. With the low temperatures required, there is no rapid cooling from high temperatures and therefore no embrittlement. Excellent ductility and high strength of the weld metal deposited by Tobin Bronze-481, Anaconda-997 (Low Fuming) Bronze, and Nickel Silver-828, permit yielding while the repairs are being made and after they are returned to service, and the danger of failure is practically eliminated.



A 7-foot fracture in this 6-ton press was repair welded in three days—20 hours preparation, 48 hours oxyacetylene welding time, using 400 lb. of Tobin Bronze-481 Welding Rod.

The braze-welding operation itself is virtually foolproof because the molten bronze automatically "tins out" or spreads over the joint surfaces when the correct temperature is reached. Since the base metal is not melted, control of the weld metal is very easy. Braze welding is readily done in all positions.

ADVANTAGES OF BRAZE WELDING WITH ANACONDA RODS ARE:

1. **Economy in welding time** and gas consumption.
2. **Development of low residual stresses** with less distortion and less tendency to crack.
3. **No embrittlement,** and complete machinability of the weld areas.
4. **Minimum delay** in returning the repaired parts to service.

DETAILED INFORMATION AVAILABLE

Detailed suggestions on the methods of chipping grooves, removing oil, positioning the work, and preheating are given in Publication B-13. This 32-page book gives a complete description and full information on Anaconda Welding Rods and discusses procedures for welding with copper and copper alloys in a wide variety of applications.

These are some of the subjects covered: Copper-Alloy Welding Rods in steel sheet metal work, brazing and soldering, resistance welding, surfacing, welding copper alloys to steel, arc-welding of copper and copper alloys.

For information on special problems—or for a copy of Publication B-13—write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

57109

WELDING ROD	APPROX. COMPOSITION, %	APPROX. MELTING POINT	
		Deg. C	Deg. F
Tobin Bronze-481	59 copper, 0.60 tin, 40.40 zinc	885	1625
Anaconda-997 (Low Fuming) Bronze	57.80 copper, 40.27 zinc, 0.95 tin, 0.85 iron, 0.10 silicon and 0.03 manganese	870	1598
Nickel Silver-828	48.58 copper, 41 zinc, 10.25 nickel, 0.15 silicon, 0.02 phosphorus	930	1706

ANACONDA®
WELDING RODS